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POLYETHYLENE FILM-FORMING
COMPOSITION

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This invention relates to new compositions of matter and to methods for their preparation.

The invention has as an object the preparation of new and improved film-forming compositions. A further object is the production of valuable supported and unsupported films. Other objects are disclosed hereinafter.

The above objects are accomplished by blending in the manner more particularly pointed out hereinafter a normally solid polymer of ethylene and a mixture of a naturally occurring fatty acid glyceride and an ester of a carboxylic acid containing at least 14 carbon atoms with an alcohol containing at least 8 carbon atoms and preferably 11-18 carbon atoms.

In the best method of practicing the invention the normally solid ethylene polymer is blended, usually by milling on rolls, with the fatty acid glyceride and an ester of a carboxylic acid containing at least 14 carbon atoms with an alcohol containing 11 to 18 carbon atoms, the mixture of fatty acid glyceride and ester constituting from 0.5% to 2% by weight of the ethylene polymer and the mixture of glyceride and ester consisting of from 25% to 40% of the glyceride and from 75% to 80% of the ester.

The following example, in which the parts are by weight, further illustrates the practice of the invention.

Into 100 parts of a polymer of ethylene having a molecular weight of about 15,000 is worked one part of undecyl stearate and 0.5 part of palm oil by milling on rolls heated at 130-135° C. The hot blend prepared in this fashion is transferred to the bight formed by the first and middle rolls of a vertical three-roll calender, the rolls of which are maintained at 135-140° C. After passing between the top and middle rolls and then between the middle and bottom rolls of the calender the composition is stripped from the bottom of the lowest roll in the form of a continuous film, with the aid of an air blast directed against the surface of the calender roll at the point where the film is stripped. The film thus obtained is tough, flexible and essentially free from pin holes. It is well adapted for use as a moisture proof wrapping foil.

Replacement of the palm oil in the above composition with other naturally occurring fatty acid glycerides, such as, coconut oil, linseed oil, etc., gives products of similar properties.

The long chain ester of the carboxylic acid containing at least 14 carbon atoms is, as previously indicated prepared preferably with an alcohol containing 11 to 18 carbon atoms. Useful com-

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positions can be obtained however with esters of alcohols containing eight or more carbon atoms. Examples of other esters that can replace that used in the foregoing example comprise dodecyl stearate, myricyl linoleate, octadecanediol mono-laurate, octyl arachidate, decyl eicosanate, lauryl palmitate and the like.

The proportions of the ethylene polymer to the mixture of ester and glyceride and of the ester and glyceride in the mixture thereof can vary somewhat from that given in the best embodiment of the invention outlined above. Generally the mixture of glyceride and ester constitutes from 0.1% to 10% by weight of the ethylene polymer and wherein the mixture of glyceride and ester consists of from 10% to 50% of the glyceride and from 90% to 50% of the ester.

The temperature of the calender rolls is critical for the successful production of well-formed films. In general, the rolls should be maintained between 110° and 150° C., if tough films which are free of holes are to be obtained. If temperatures in excess of 150° C. are used, the film is too soft and below 110° C. it is not sufficiently plastic for removal from the rolls as a continuous, tough film. As a rule, it is preferred to maintain the rolls between 120° and 140° C. In order to remove films having a thickness of less than 3 mils, it is necessary to resort to the use of an air blast as described in the example. Thicker films, say from 10-30 mils in thickness can be removed from the rolls without the use of an air blast. One of the important advantages of thin films is that they are smoother, more pliable and more transparent than thick films and hence more readily adaptable for use as wrapping foils, and for coating fabrics. The production of such films therefore constitutes a particular, preferred embodiment of this invention.

The solid ethylene polymers which are used in the practice of this invention are made by heating ethylene alone, as described in U. S. Patents 2,153,553 and 2,165,465 or in admixture with one other polymerizable organic compound, as described in U. S. Patent 2,200,429. The polymers of ethylene alone or in admixture with other polymerizable organic compounds can also be obtained by contacting ethylene alone or in admixture with another polymerizable organic compound with water and a peroxy compound at a temperature in the range of 40°-350° C. and under a pressure in excess of atmospheric, and preferably in the range of 3-1500 atmospheres. The polymers of ethylene alone are solids at normal temperatures, correspond in composition sub-

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stantially to $(CH_2)_x$, and have a molecular weight above 6000. The properties of the polymers of ethylene with other polymerizable organic compounds depend upon the composition of the polymer and the nature of the polymerizable organic compound.

The compositions described herein make possible the preparation from ethylene polymer of valuable unsupported transparent films, and particularly of thin films of enhanced utility. These compositions are also useful in the preparation of improved supported films by calendering on a non-rigid support, such as paper, fabric or metal foil.

The compositions described herein, as compared to known ethylene polymer compositions, are of special value in that they can be readily sheeted on calender rolls at temperatures above 120° C. into tough, transparent and flexible films. This is an important characteristic because optimum film properties cannot be realized in the prior manufacture of ethylene polymer films at temperatures below about 125° C. by calendering technique which has many recognized advantages over other methods of film manufacture, i. e. adaptability to a greater range of film dimensions and freedom from expensive and hazardous solvents and recovery systems therefor.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is

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to be understood that I do not limit myself to the specific embodiments thereof, except as defined in the appended claims.

I claim:

1. A composition of matter comprising in major amount a normally solid polymer of ethylene and a mixture in amount of from 0.1% to 10% by weight of said polymer, of naturally occurring fatty acid glyceride and an ester of a carboxylic acid containing at least 14 carbon atoms with an alcohol containing at least 8 carbon atoms, said mixture consisting of from 10% to 50% of said glyceride and from 90% to 50% of said ester.

2. A self supported film comprising the composition set forth in claim 1.

3. A flexible base material coated with a film of the composition set forth in claim 1.

4. The composition set forth in claim 1 in which said mixture is present in amount of from 0.5% to 2% by weight of said ethylene polymer and in which said mixture consists of from 25% to 40% of said glyceride and from 75% to 60% of said ester.

5. A composition of matter comprising in major amount a normally solid polymer of ethylene and a mixture, in amount of from 0.1% to 10% by weight of said polymer, of palm oil and undecyl stearate, said mixture consisting of from 10% to 50% of the palm oil and from 90% to 50% of the undecyl stearate.

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