

UNITED STATES PATENT OFFICE

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TRANSPARENT FLEXIBLE FILM

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This invention relates to transparent films adapted for the wrapping of packages and for other uses such for example as coatings upon various articles, cartons, paper sheets, etc., and has for its object broadly the provision of an improved film which may be produced economically and through the use of ingredients generally available in large quantities and obtainable at low costs.

The invention has for further important object the provision of a film of the character described which may be easily sheeted and which by simple changes in the formulae and in the steps of the process of manufacturing the product may be given varied characteristics adapted to meet particular and intended needs.

The invention contemplates the production of a transparent flexible film of improved characteristic which may be produced mainly from vegetable materials and in this regard contemplates the production of such a film from a suitably treated vegetable protein.

A further and separate object of the invention is the provision of a flexible transparent film of the character described which may be manufactured economically from Indian corn with or without added plasticizing and fixing materials and/or with or without materials added to accomplish water or moisture proofing.

Another important object of the invention is the provision of a composition for the forming of a film of the character described which may be more easily and more quickly dried than has heretofore appeared practical in the manufacture of films intended to fulfill the purposes of the film of this invention.

In accordance with the present invention the film is preferably mainly composed of a vegetable protein. The protein is or may be a prolamin such for example as zein derived from corn gluten. The protein is preferably and for most intended uses of the film fixed with some tanning agent as formaldehyde and the invention contemplates the use when desired of a suitable plasticizer, such for example as di-butyl phthalate.

The zein is extracted from corn gluten by dissolving it in a mixture of alcohols and some water. Since this process of extracting zein from gluten forms no part of the present invention particular description of such extraction will not here be undertaken. As the result of such extraction an alcohol water solution of zein is produced consisting typically of approximately 10% zein and 90% alcohol water solvent. Preferably

this solution is first concentrated to bring the percentage of zein up to about 20% of this concentrated solution. We preferably add to this solution a plasticizer which is compatible with the zein in the alcohol water solvent, such as di-butyl phthalate.

The resulting compound is then run over or onto a suitable sheeting or filming surface and the solvent evaporated to produce the desired film, thereafter the film or sheet is or may be fixed with some suitable tanning agent preferably an aldehyde as formaldehyde.

A typical formula is or may be 1% of di-butyl phthalate of the 20% solution of zein. In addition to the di-butyl phthalate plasticizing agent and the zein, it is often desirable to add a quantity of glucose up to 10% and higher to the solution before final drying.

After the compound has been evaporated upon the filming or sheeting surface to coherency and preferably before complete drying is accomplished it is treated with a tanning agent either in liquid form or gaseous form.

In order to insure that the film does not become cloudy in the sheeting and final drying we prefer to incorporate about 2% to the 20% zein solution of tri-ethanolamine in the solution.

Since the materials do not have a tendency to devitalize at relatively high temperatures when wet and since the solvents employed are largely alcohols quick drying at relatively high temperature is or may be accomplished.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing without further description and it will be apparent that various changes may be made in the ingredients, in their proportions, and in the steps of producing the film without departing from the spirit or scope of the invention or sacrificing all of its material advantages. The form hereinbefore described being merely a preferred embodiment thereof.

We claim:

1. A transparent flexible film adapted for the wrapping of packages and for other uses, which comprises a fixed prolamin and di-butyl phthalate as a plastizer, and a transparentizing quantity of tri-ethanolamine.

2. A transparent flexible film adapted for the wrapping of packages, which comprises a fixed prolamin having admixed therewith a plasticizing quantity of di-butyl phthalate, and glucose.

3. A transparent flexible film adapted for the wrapping of packages and for other uses, which comprises a fixed zein base, a plasticizing quan-

tity of di-butyl phthalate, and a transparentizing quantity of tri-ethanolamine.

4. A transparent flexible film adapted for the wrapping of packages and for other uses which comprises a fixed zein base, a plasticizing quantity of di-butyl phthalate, said di-butyl phthalate

being variable from 1 part to every 20 parts of zein, and a transparentizing quantity of tri-ethanolamine, said tri-ethanolamine being variable from 2 parts to every 20 parts of zein.

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