CLAIMS

What is claimed is:

1. A continuous extrusion process for producing a celluloid article comprising the steps of:

providing a quantity of nitrocellulose;

providing a quantity of camphor;

providing an extruder defining a chamber, an opening for receiving materials into said chamber, at least two screws for mixing material in said chamber, and an extrusion die coupled to said chamber for extruding material located in said chamber; said chamber comprising a first zone, a second zone, a third zone and a devolatilization zone;

introducing the nitrocellulose into said first zone of said chamber, said first zone being maintained at a temperature between about 5°C and about 15°C;

dissolving said camphor in a low boiling point solvent and introducing said camphor solution into said first zone or said second zone of said chamber;

adding an additional solvent to said first zone or said second zone;

transporting the nitrocellulose into said second zone of said chamber;

continuously mixing said nitrocellulose, camphor and solvent in the said second zone to form a mixture;

transporting said mixture to said third zone of said chamber and further continuously mixing said mixture at a higher rate of mixing and temperature relative to said first zone;

transporting said mixture to said devolatilization zone and extracting solvent from the mixture in said devolatilization zone by heating the mixture to above boiling points of said solvents;

extruding said mixture through said die to produce a celluloid article; and

removing the solvents from said celluloid film.

2. The process of claim 1 wherein the low boiling point solvent is selected from the group consisting of a low molecular weight aliphatic ketone, a low molecular weight aliphatic alcohol and mixtures thereof.

3. The process of claim 1 wherein the additional solvent is selected from the group consisting of a low molecular weight aliphatic ketone, a low molecular weight aliphatic alcohol and mixtures thereof.

4. The process of claim 1 wherein the second zone has a temperature of about 50°C to about 60°C.

5. The process of 1 wherein the third zone has a temperature of about 60°C to about 80°C.

6. The process of claim 1 wherein the devolatilization zone has a temperature of about 75°C to about 90°C.

7. The process of claim 1 wherein at least one of the zones has higher rate of mixing.

8. The process of claim 1 wherein the extruding occurs at a rate of 1 foot per minute to 10 feet per minute.

9. The process of claim 1 wherein the solvents are removed from the celluloid article using at least one warm water bath.

10. The process of claim 1 wherein the celluloid article is a sheet, a rod or a tube.

11. A continuous extrusion process for preparing celluloid articles comprising the steps of:

providing a quantity of nitrocellulose;

providing a quantity of camphor;

providing an extruder defining a chamber, an opening for receiving materials into said chamber, means for mixing material in said chamber, and an extrusion die coupled to said chamber for extruding material located in said chamber; said chamber comprising a first zone, a second zone and a devolatilization zone or a combination thereof;

introducing the nitrocellulose into said first zone of said chamber, said first zone being maintained at a temperature where the nitrocellulose will not ignite, preferably between about 5°C to about 15°C ;

dissolving said camphor in a low boiling point solvent and introducing said camphor into said first zone or said second zone of said chamber;

adding an additional solvent to said first zone or said second zone;

transporting said nitrocellulose into said second zone of said chamber;

continuously mixing said nitrocellulose, camphor and solvent in the said second zone to form a mixture;

transporting said mixture to said devolatilization zone and extracting solvent from the mixture in said devolatilization zone by heating the mixture to above boiling points of said solvents;

extruding said mixture through said die to produce a celluloid article; and

removing the solvents from said celluloid article.

12. A celluloid article prepared by a continuous extrusion process comprising the steps of:

providing a quantity of nitrocellulose;

providing a quantity of camphor;

providing a twin screw extruder defining a chamber, an opening for receiving materials into said chamber, at least two screws for mixing material in said chamber, and an extrusion die coupled to said chamber for extruding material located in said chamber; said chamber comprising a first zone, a second zone, a third zone and a devolatilization zone;

introducing the nitrocellulose into said first zone of said chamber, said first zone being maintained at a temperature between about 5°C and about 15°C;

dissolving said camphor in a low boiling point solvent and introducing said camphor solution into said first zone or said second zone of said chamber;

adding an additional solvent to said first zone or said second zone;

transporting the nitrocellulose into said second zone of said chamber;

continuously mixing said nitrocellulose, camphor and solvent in the said second zone to form a mixture;

transporting said mixture to said third zone of said chamber and further continuously mixing said mixture at a higher rate of mixing and temperature relative to said first zone;

transporting said mixture to said devolatilization zone and extracting solvent from the mixture in said devolatilization zone by heating the mixture to above boiling points of said solvents;

extruding said mixture through said die to produce a celluloid article; and

removing the solvents from said celluloid article.

CLAIMS

1. A continuous extrusion process for producing a celluloid article comprising the steps of:

providing a quantity of nitrocellulose;

providing a quantity of camphor;

providing an extruder defining a chamber, an opening for receiving materials into said chamber, at least two screws for mixing material in said chamber, and an extrusion die coupled to said chamber for extruding material located in said chamber; said chamber comprising a first zone, a second zone, a third zone and a devolatilization zone;

introducing the nitrocellulose into said first zone of said chamber, said first zone being maintained at a temperature between about 5°C and about 15°C;

dissolving said camphor in a low boiling point solvent selected from the group consisting of: methanol, ethanol, acetone, and mixtures thereof, to form a camphor solution, and introducing said camphor solution into said first zone or said second zone of said chamber;

adding an additional solvent to said first zone or said second zone;

transporting the nitrocellulose into said second zone of said chamber;

continuously mixing said nitrocellulose, camphor solution, and additional solvent in said second zone to form a mixture;

transporting said mixture to said third zone of said chamber and further continuously mixing said mixture at a higher temperature relative to a temperature of said first zone;

transporting said mixture to said devolatilization zone and extracting a first amount of both the low boiling point and additional solvents from the mixture in said devolatilization zone by heating the mixture to a devolatilization temperature that is above the normal, atmospheric boiling points of both said low boiling point and additional solvents;

extruding said mixture through said die to produce a celluloid article; and

removing a second amount of the low boiling point and additional solvents from said celluloid article.

2. The process of claim 1, wherein the first zone is maintained at a temperature between about 5°C and about 15°C, and wherein the second zone has a temperature of about 50°C to about 60°C.

3. The process of claim 1 wherein the third zone has a temperature of about 60°C to about 80°C.

4. The process of claim 1 wherein the devolatilization zone has a temperature of about 75°C to about 90°C.

5. The process of claim 1 wherein the extruding occurs at a rate of about 5 millimeters per second to about 50 millimeters per second.

6. The process of claim 1 wherein the solvents are removed from the celluloid article using at least one warm water bath.

7. The process of claim 1 wherein the celluloid article is a sheet, a rod or a tube.

8. A continuous extrusion process for preparing celluloid articles comprising the steps of:

providing a quantity of nitrocellulose;

providing a quantity of camphor;

providing an extruder defining a chamber, an opening for receiving materials into said chamber, means for mixing material in said chamber, and an extrusion die coupled to said chamber for extruding material located in said chamber; said chamber comprising a first zone, a second zone and a devolatilization zone or a combination thereof;

introducing the nitrocellulose into said first zone of said chamber, said first zone being maintained at a temperature where the nitrocellulose will not ignite;

dissolving said camphor in a low boiling point solvent selected from the group consisting of: methanol, ethanol, acetone, and mixtures thereof, to form a camphor solution, and introducing said camphor solution into said first zone or said second zone of said

chamber;

adding an additional solvent to said first zone or said second zone;

transporting said nitrocellulose into said second zone of said chamber;

continuously mixing said nitrocellulose, camphor solution and additional solvent in said second zone to form a mixture;

transporting said mixture to said devolatilization zone and extracting a first amount of both the low boiling point and additional solvents from the mixture in said devolatilization zone by heating the mixture to a devolatilization temperature that is above the normal, atmospheric boiling points of both said low boiling point and additional solvents;

extruding said mixture through said die to produce a celluloid article; and

removing a second amount of both the low boiling point and additional solvents from said celluloid article.