

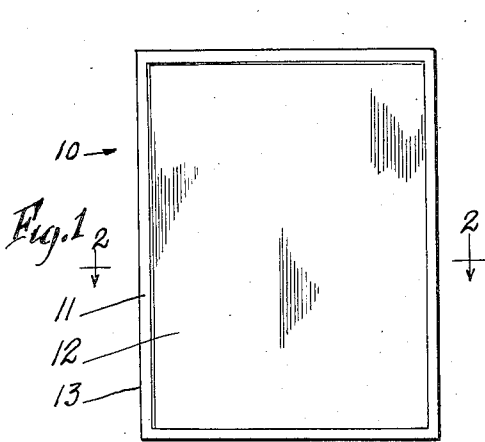
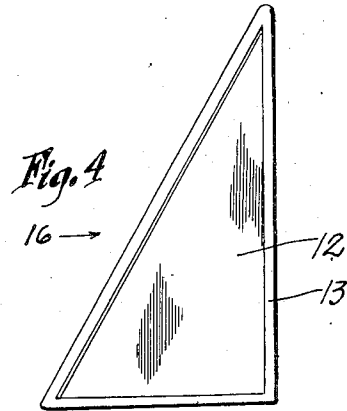
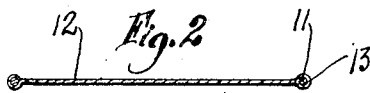
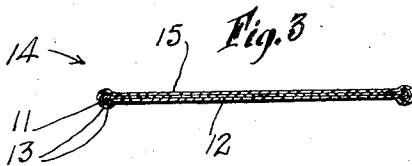
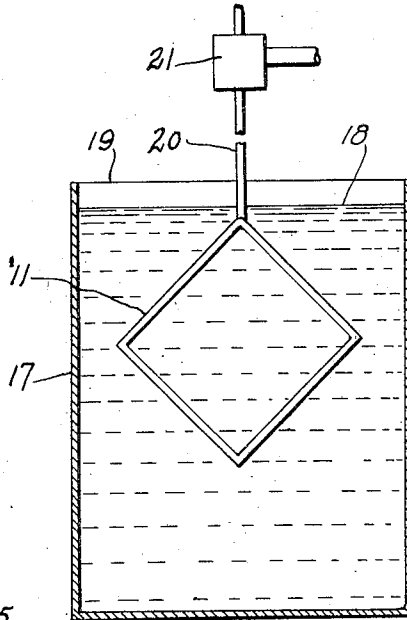
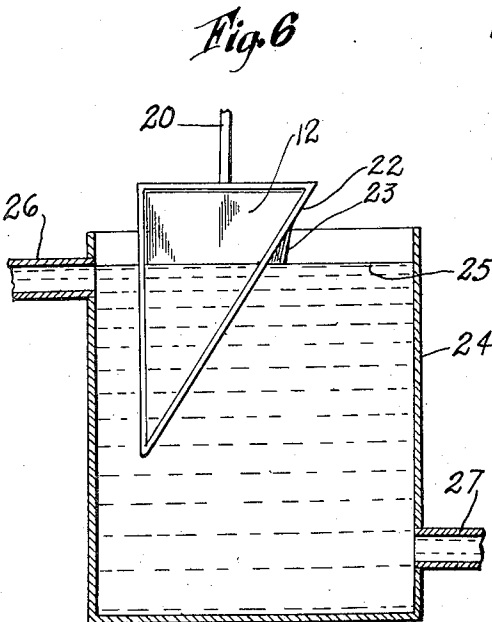
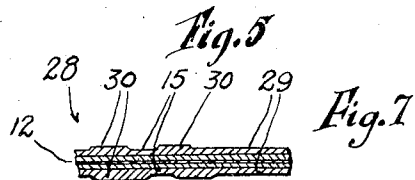
April 21, 1936.

M. GREENAN

2,037,893

BRIDGING FILMS AND METHOD OF MAKING THE SAME

Filed Oct. 30, 1935



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BRIDGING FILMS AND METHOD OF MAKING
THE SAME

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8 Claims. (Cl. 18—58)

This invention relates to methods of bridging relatively thin open work frames by dipping in fluid compositions, and also to such frames bridged with a self hardening composition.

5 An object of the invention is to provide a method of bridging which is applicable to openings of comparatively large widths, and a novel fluid composition being utilized having volatile solvents, and being comparatively viscous or heavy and having a relatively high drying quality.

10 While small openings can be bridged in different ways by using such a composition, I found that the film of composition would sometimes continue to break even after repeated and careful attempts to bridge a large opening. This would occur even after thorough checking of the viscosity and other possible factors indicated that all the circumstances for the bridging operation appeared wholly favorable.

20 Upon providing for the composition bath a surface wholly free and fully exposed to the atmosphere, substantially at the region of said surface, I found that the bridging operation was uniformly successful. Apparently the solvent fumes from the bath were affecting and causing breakage of the delicate bridging film as the frame was being withdrawn from the bath at said surface. Such is the critical interplay of these factors, that forced or draft aeration of the surface region of the composition bath is unnecessary, it being sufficient that ordinary atmosphere shall have free communication at the top and sides thereof, to facilitate dissipation or dilution of the generated vapors. In fact, forced draft is undesirable as it may cause breakage of the film by the undue force of an air or gas stream impinging against the film. Nor can the difficulty of breakage of the film by fumes arising into the atmosphere into which the film is removed be avoided by any change in viscosity of the bridging composition, nor by any change in the drying quality thereof.

40 Another object of the invention, therefore, is to provide a method which shall overcome the above mentioned difficulties and afford the advantages noted, and which shall be simple and inexpensive in use, and be adapted for the production of rugged, efficient and attractive articles; and a further advantage is to provide a dipped article which may be thus completed substantially without requiring additional finishing operations, and which shall possess uniform tautness in all directions, combined with a suitable flexibility or yield to avoid accidental breakage in use.

55 This application is a continuation in part of my patent application, Serial No. 32,168, filed July 19th, 1935, and of my patent application, Serial No. 727,246, filed May 24th, 1934.

60 Other objects and advantages of the invention

will become apparent as the specification proceeds.

With the aforesaid objects in view, the invention includes the novel combinations and arrangements of parts hereinafter described in their preferred embodiments, pointed out in the subjoined claims, and illustrated in the annexed drawing, wherein like parts are designated by the same reference characters throughout the several views.

In the drawing:

Figure 1 is a view in front elevation of a device embodying the invention.

Fig. 2 is a sectional view thereof taken on the line 2—2 of Fig. 1.

Fig. 3 is a similar view showing a reenforcing coating on the bridging film.

Fig. 4 is a view in front elevation of a modified device embodying the invention.

Figs. 5 and 6 are sectional diagrammatic views showing steps in the method of the invention.

Fig. 7 is a cross sectional magnified view of a bridging wall having two coatings on the bridging film with the outer coating ornamented by controlling the flow of the liquid producing the outer coating.

The advantages of the invention as here outlined are best realized when all of its features and instrumentalities are combined in one and the same structure, but, useful devices may be produced embodying less than the whole.

It will be obvious to those skilled in the art to which the invention appertains, that the same may be incorporated in several different constructions. The accompanying drawing, therefore, is submitted merely as showing the preferred exemplification of the invention.

Heretofore, it has been known to bridge with a lacquer the openings in frames or the like to produce different ornamental articles such as individual leaves, petals of flowers and the like. That openings of large size could be thus bridged was not known and was thought impossible because of the delicacy of the film and its tendency to break before hardening, due to several factors including the weight of the film itself. By the size or largeness of the opening as used herein is meant primarily the width of the opening as the frame is being upwardly withdrawn from the coating bath. The upright length of the opening as withdrawn is immaterial, except as hereinafter described, but the width represents the span to be bridged by the liquid composition. While lacquers of different viscosities and drying qualities were known, it was nevertheless not thought feasible or practical to attempt to bridge large openings.

By my invention, I found that it may be possible to bridge openings of large size by suitably increasing the viscosity or the drying quality, preferably both. As hereinbefore described, I found

thereafter that these factors alone were insufficient, and that it is necessary to properly preserve the film as the same is being formed and before appreciable hardening has occurred. This represents the crucial time in forming such film, and any adverse influence will readily cause it to collapse. Owing to the inherent nature of the film as formed, its extreme thinness, lightness and weakness, observation of the cause of breakage is naturally extremely difficult. However, I found that if the presence of more or less concentrated fumes of the volatile solvent in the lacquer is kept away from the film, breakage of the latter during its critical time of formation is prevented.

To bridge a large opening, the lacquer or like composition must have sufficient viscosity, preferably higher than that of the lacquer sold on the market. In other words, the lacquer for bridging must be specially prepared, and must preferably have a sufficient amount of plasticizers, substantially higher than that heretofore used, so that the film will be yieldable and will not unduly shrink and crack upon hardening.

Then again, the rate of drying must be greater than that of lacquers sold on the market, since hardening of the bridging film must begin and rapidly proceed even as the film is formed. This is important so that the film will be able to carry its own weight and in addition withstand the tension exerted on it by the bath as the film is being "pulled" from the bath. Furthermore, while the prior practise in bridging small openings involved the use of lacquers having an increased amount of plasticizers, yet these had to be materially increased according to my invention.

A greater rate of drying signifies more powerful or an increased amount of volatile solvent in the lacquer. Hence the tendency to breakage of the film by substantially concentrated solvent fumes correspondingly increases.

An added factor is that the opening to be bridged must be withdrawn relatively slowly from the bath to prevent undue strain on the film as formed and possible tearing thereof from its continuity with the liquid bath, whereby breakage may result. The relatively slow withdrawal further assures a proper flow of excess liquid back into the bath and precludes unevenness in the film and breakage due to the weight of a stream of excess liquid, and its tendency to "cut" the film or retard the rapid drying thereof uniformly at all points. The relatively slow withdrawal of the opening as bridged is also rendered desirable by the viscosity of the liquid, and is required in order to afford some short time for the initial drying to occur, so that the upper part of the film becomes sufficiently strong, progressively, to support the film that is being formed and which depends therefrom. However, if the withdrawal be too slow, breakage of the film may result.

This relatively slow withdrawal from the bath of the opening to be bridged results in that the film is maintained for an increased period of time in the immediate vicinity of the liquid bath and hence subject in correspondingly greater degree to the solvent fumes that are constantly being generated. Therefore the importance of removing, aerating or diffusing such fumes is correspondingly increased.

A thin open work frame that is to be bridged is dipped into a bath of the lacquer or like composition in any suitable manner or position to provide the bridging film. It may be spun in the bath to remove air particles from the frame to obtain a uniform film and coating for the frame,

but preferably spinning is undesirable, and for some purposes air particles may be forced into the bath to form decorative globules. This film becomes part of the surface character of the frame, and completely encloses the same, and serves to connect the film to the frame uniformly and continuously throughout.

The frame may consist of any suitable material, and may be rigid or resilient as desired. For example, a wire frame is desirable, as it is cheap and possesses some degree of resilience which together with the flexibility of the hardened film, permits the article to withstand jars or shocks without breakage or distortion. But the frame ought to have sufficient stiffness to retain its shape and to maintain a certain degree of rigidity to avoid breakage of the film as the same is being formed.

A substantially or perfectly quiescent condition of the bath is also desirable, when the frame is being withdrawn therefrom, so as to avoid such agitation as will tend to break the film.

Then again, the frame ought to be withdrawn from the liquid bath in a steady manner, so as to avoid agitation of the liquid and possible lateral strains on the film.

As soon as the lower end of the opening has left the liquid bath, so that the bridging of the opening has been completed, the frame may be rapidly or otherwise removed from the region of the liquid bath, and carefully deposited somewhere where it can become fully hardened, without being jarred or moved about. The film ought to remain in an upright position until it has substantially hardened.

The features hereinbefore described are applicable in various combinations and arrangements, according to their relative importance and the work that is to be performed, to the bridging of large openings, such as those in excess of 3 inches, and particularly to openings of approximately 4 inches in size and larger. To openings of 4 inches and greater, the bridging process provided by my invention is essential. Concerning the relative importance of the features, the spinning operation may be omitted; the withdrawal of the frame from the bath while preferably vertical and with the opening maintained in a vertical plane, may be merely upright and with the opening in an upright plane; the viscosity for openings of three inches need not be high and may in fact be ordinary, but higher viscosities being necessary for larger openings; the rate of withdrawal is of no particular importance, it being sufficient that it shall not be substantially instantaneous; the steadiness of withdrawal of the frame from the liquid bath may be such as may be done by ordinary manual withdrawal of the frame under wholly manual control; the quiescent condition of the bath need not be perfect, since after spinning the frame, the latter may be withdrawn almost immediately from the bath, especially as the bath quickly loses any motion it may have; a considerable range of characteristics of viscosities and drying qualities may be used, and the characteristics required for bridging openings, such as those of 8 and 10 inches may be used in bridging openings of 3 and 4 inches; and finally, the process may be carried on at ordinary room temperatures and under ordinary atmospheric conditions, though preferably not unduly humid. It may be noted that the vertical removal of the frame from the bath with the opening lying in a vertical plane is preferable

since there is less impingement or agitation of the solvent gases against and by the film; and generally speaking, the elimination of concentrated solvent fumes as hereinbefore noted is satisfied by preventing or avoiding a concentration of the fumes.

After the bridging film has become hardened, the frame may be dipped into another coating or hardening composition which upon drying strengthens the film. If the subsequent dipping were into a composition of like chemical character with the first coating composition, the film provided by the latter would be cut and dissolved away. Hence the subsequent coating composition, while of any suitable character, is such as not to affect the hardened condition of the film, whereby the film shall be capable of withstanding the strain of the subsequent dipping and the weight of the coating and drippings resulting in forming such coating. The subsequent dipping may be accomplished simply and in any suitable manner such that detailed description is not required. Desirably, the subsequent dipping is effected with the vertical or upright removal of the frame in the vertical or upright plane to reduce strain on the film and facilitate the flowing off of the drippings. Any other precautions may be readily exercised by any one skilled in the art in dipping and coating a delicate film or fabric.

To prevent dissolving away of the basic or bridging film, if the same be an acetate, then the subsequent coating may be a gelatinous compound, or preferably a nitrate. The composition for the subsequent coating may have any desired, preferably low, viscosities and drying qualities, especially the former, to afford an even and uniform coating; and generally, the compositions having the lower viscosities and drying qualities are cheaper and easier to preserve and maintain relatively uniform. Upon hardening of the reinforcing coating, the frame may be redipped in any acetate bath, or in a gelatinous or nitrate bath, and so on, indefinitely to produce any required strength or visual effect, providing only that an acetate coating shall not be dipped into an acetate bath, nor a nitrate coating into a nitrate bath. Gelatinous compounds will result in less transparency and less uniformity than the acetate or nitrate compounds. The basic or bridging film may be either a nitrate or an acetate, but preferably an acetate is used because it possesses certain qualities which tend to cause less breakage of the film than would be the case in bridging with a nitrate. The final coating is preferably either a gelatinous or an acetate compound because these have less inflammability than a nitrate compound. By applying two or more coatings to the bridging film, a wall may be produced which is substantially as strong and tough as the diaphragm of a drum. The different coatings strongly adhere to each other and to the film to produce a wall of uniform strength throughout. Such adherence is promoted by keeping the film and coating uniformly clean.

In providing the reinforcing coatings for the bridging film, different artistic effects can be produced at will by the operator. For example, the operator may tilt and turn the frame to control or guide the flow of the coating liquid along the bridging film or the coating already formed thereon. Also air jets may be blown to guide or control the coating liquid or excess thereof along the film or coating. Then again, the coating liquid may be sprayed on as desired. At those

points where a greater amount of the coating liquid solidifies, there is less transparency, or translucency, and thus the design effects are obtained. Of course, the wall may also have designs painted thereon in any suitable manner. If desired, the wall may be redipped to at once cover and preserve the paints or dyes and to re-enforce the wall.

Referring in detail to the drawing, 10 denotes a device embodying the invention. The same may include a frame element 11 of any suitable size, shape or material and may, for instance, consist of a wire of suitable stiffness which may be $\frac{1}{2}$ but is preferably $\frac{1}{8}$ to $\frac{1}{4}$ inch thick, but which may be $\frac{1}{8}$ or somewhat greater in thickness. Generally speaking, the thickness may be such as not to unduly agitate the liquid bath in withdrawing the frame, nor to unduly interfere with the flow of drippings therefrom. Bridging the opening of the wire frame is a continuous film 12 which may comprise portions 13 that encase the frame and thus secure the film thereto. Thus attractive outlining rib formations are produced, with the bridging film lying in the plane of the frame.

In Fig. 3 is shown the device 14 similar to 10 but with a coating 15 of a reinforcing material uniformly and continuously superposed on the film and frame encasing portions 12, 13.

In Fig. 4 is shown a device which may be like that at 10 or 14, but of right, triangular form, to simulate, for instance, the sail of a small boat. In every case the opening in the frame should preferably not be vertically interrupted or breakage of the film may result. If the opening were divided by a cross wire, the resulting openings can be separately bridged.

In Fig. 5 is shown a step in the method of making a device such as 10, according to the invention. A container 17 is filled with the bridging composition up to a level 18 relatively near the free open and unobstructed top 19 of the container to permit dissipation of solvent fumes into the atmosphere. The frame 11 may be supported upright in any suitable manner on a vertically movable rod 20 guided in fixed means 21 which may include means for rotating the rod and hence the frame to remove air bubbles from the latter. The rod 20 may be detachably secured to the frame in any suitable manner, desirably at the corner. After removal of the article from the bath, the drippings that may remain sticking to the frame may be wiped off gently, but otherwise no further treatment is necessary except as specified.

In Fig. 6 is shown a means for bridging a device such as 16, the open frame 22 of which may be supported on a rod such as 20, preferably with the smaller end downward. This, while not essential, facilitates the bridging operation, as the width of the opening constantly decreases. Drippings at the inclined edge may flow off away from the film as indicated at 23 in course of withdrawal of the frame upwardly in an upright plane. The container 24 for the bridging composition 25 may be connected by pipes 26, 27 in circulatory relation with an otherwise closed reservoir for the composition to thus maintain the level of the bath and to assure uniformity in the character of the bath. The circulatory action may be relatively slow. The reservoir may be vertically adjustable.

In Fig. 7, the wall 28 may have a second outer coating 29 having areas 30 of increased thickness to produce a design.

The article produced, and indicated as at 10, 14, and 16, is thus relatively yielding to prevent accidental breakage by an impact thereon, and the film and coating are wholly taut throughout and uniformly so because the compositions are hardened on the frame.

I will now render further and detailed description of the method. Various compositions or lacquers or "airplane dope" may be used having a required viscosity and drying quality for producing the basic or bridging film. Generally speaking, the viscosity may be substantially less than that required for the bridging of the openings of a conoidal open work frame in inverted condition as described in detail in my copending application, Serial No. 132,168, filed July 19th, 1935. Thus I may employ a viscosity range between 5 and 65 poises. Desirably the lacquer composition should be relatively free of water.

The drying quality of the composition may be indicated as being such that a film of the liquid may initially harden within a period of 25 to 40 seconds of time to produce a bridging skin approximately 0.0001 inch thick, where the initial hardening is indicated by the cessation of flow or movement of particles or fine globules of liquid in the film as observed by the naked eye, and where the initial hardening is effected in ordinary atmosphere as above noted and free of concentrated solvent vapors from the liquid bath. Thereafter the article may be set aside for from 10 minutes to one or two hours to fully harden.

Concerning viscosity, various methods of determination are used. The figures reported are based on the so called Hercules falling ball method which is a standard method and is described in the booklet "nitrocellulose" published by the Hercules Powder Co.

The poise is the scientific unit of viscosity. It is the shearing stress in dynes per square centimeter required to move either of two parallel planes, one centimeter apart relative to each other, with a velocity of one centimeter per second, the space between the planes being filled with the fluid. The approximate viscosity of water at 20° C. is one hundredth of a poise or one centipoise (1.005 cp). Seconds Hercules, multiplied by the factor 3.77 give the corresponding viscosity in poises.

There is of course an interrelation between viscosity and drying quality. If the composition dries too fast, the viscosity may be or become so high as to cause breakage of the film, and may not afford sufficient time for the flow off of excess liquid. If the composition dries too slowly or the viscosity be too low, the film will break. Then again, if the rate of removal of the frame from the screen be too slow, the elasticity of the film is diminished by drying and breakage may result. With these considerations in mind, and the fact that the action in bridging is physical, rather than chemical, it will be appreciated that the formulas hereinafter stated are given in an illustrative rather than in a limiting sense, and that other compositions may be used.

It may be noted at this point that the opening may be withdrawn from the bridging bath at a rate of 3 to 15 or 20 seconds per foot length, and that the withdrawal may be at an angle of 30 or 45 degrees, though preferably vertical. After withdrawal, the article may be set aside to air harden for 10 minutes or one or two hours.

By way of illustration of a liquid composition that may be used in the bridging operation contem-

plated by my invention, I disclose the following formula, in pounds of weight:

	Pounds	
Cellulose acetate.....	21	
Triphenyl phosphate.....	8	5
Ethyl para toluene sulfonamid.....	8	
Dibutyl tartrate.....	1½	
Diacetone alcohol.....	4½	
Acetone.....	76	

This formula will be designated hereinafter as Formula A.

An alternative formula is as follows:

	Pounds	
Cellulose acetate.....	21	15
Triphenyl phosphate.....	8	
Plastol resin #13.....	8	
Dibutyl tartrate.....	1½	
Diacetone alcohol.....	9	
Acetone.....	72	20

Plastol resin #13 is a secret formula manufactured by Interessens Gesellschaft für Chemische Industrie, a German concern, and is sold by Advance Solvents & Chemical Corporation, of New York, of New York city, as the representative of the German concern. Plastol resin #13 has certain advantages in my composition, as it has a high degree of body forming constituents, and yet is soft and stretchable when hardened. However, it is seen that ethyl para toluene sulfonamid is a substantial equivalent therefor, and I prefer that the percentage of diacetone alcohol be reduced and that of acetone increased.

Triphenyl phosphate, ethyl para toluene sulfonamid, Plastol resin #13, and dibutyl tartrate are softening fillers which do not unduly increase the viscosity of the composition. Diacetone alcohol and Acetone are solvents. The cellulose acetate is affected so that any possible tendency to crinkling is avoided, which it would have if the softening agents were not used.

I may also use the following formula, which while good, is not quite as satisfactory in unbreakability as the foregoing:

	Pounds	
Cellulose nitrate.....	14	
Camphor.....	6	
Castor oil.....	4	
Dibutyl phthalate.....	1	50
Hydrogenated alkylester of abeitic acid.....	4	
Ethyl acetate.....	30	
Toluole.....	22	
Ethyl alcohol.....	9	
Acetone.....	2	55
Pentanol acetate.....	3	
Secondary butyl alcohol.....	5	

It may be noted that the first five ingredients provide the film forming solids, while the remaining ingredients are volatile and evaporate to leave the film.

A more satisfactory nitrate formula is the following, hereinafter denoted as B:

	Pounds	
Cellulose nitrate (about 3 seconds Hercules).....	18	65
Camphor.....	7½	
Castor oil.....	3	
Tricresyl phosphate.....	3	
Denatured alcohol.....	8	70
Methyl acetate.....	20	
Ethyl acetate.....	4½	
Acetone.....	30	
Pentanol acetate.....	3	
Secondary butyl alcohol.....	3	75

The cellulose acetate, which may be obtained of various viscosities, is so chosen or blended by using cellulose acetate of various viscosities as to give a final lacquer having a desired viscosity.

5 The same applies to cellulose nitrate.

With the foregoing formulas as a guide, other formulas can be readily devised that will fulfill the specifications hereinbefore stated, particularly as the action of the composition in the
10 practise of my method appears to be mechanical rather than chemical.

Hence the term lacquer as used herein is intended to include all equivalent compositions. Further, the composition or lacquer is regarded
15 as sufficiently indicated by reference to its viscosity and drying quality, particularly when these are defined as hereinabove. But the data herein given is illustrative, since viscosity varies constantly due to evaporation of solvents while the bridging is in progress, and further, the required
20 viscosity range will vary with the size of opening to be bridged, the speed of frame withdrawal, the atmosphere into which the withdrawal occurs for drying, the thickness of the film, as
25 whether the same be 0.0001 inch, or less, or several times greater.

Compositions having as a base a nitrate of cellulose, or a gum may also be used; for example, an ordinary commercial lacquer from which
30 a portion of the solvents have been evaporated, and a gum or latex added in uniformly intermixed condition may be used for bridging spaces up to 5 inches in width.

In order to illustratively indicate the possible
35 viscosity ranges, I suggest the following, in poises, for Formulas A and B for openings of different maximum widths in inches as follows:

Formula A

Opening size	Lower limit	Upper limit
3	7	50
4	11	55
5	15	60
6	20	65

Formula B

Opening size	Lower limit	Upper limit
3	10	70
4	19	75
5	23	80
6	30	100

It will be noted that Formula B requires a substantially higher viscosity, for example, by 50%, than Formula A. It may be noted that the viscosity of Formula A is approximately 40 poises. That of Formula B, as herein given, is, however, lower, and is approximately 26 poises (7 seconds Hercules). Viscosities are taken at 70° F., and my process may be performed at ordinary room
65 temperatures.

It will be seen that if any one of the viscosities given for the upper limit be taken, all openings can be bridged. Thus for openings of 3 to 6 inches, any viscosity for Formula A of from 50 to 65 may be used; and for Formula B, any viscosity from 70 to 100 may be readily used.

The best practice is to use, for an opening of a given size, a viscosity approximately one-third of the range above the lower limit of viscosity.
75 Thus for a 4 inch opening, using Formula A, the

viscosity is preferably about 25 poises. If a viscosity in the neighborhood of 50 is used with Formula A, the film becomes uneven, and less clear, as it tends to entrap and hold air bubbles; but is otherwise satisfactory. Ordinarily the more viscous liquid will require a slower drying quality, to afford the film more time to smooth out and release air bubbles. A less viscous liquid requires more skill in handling, but produces a film of superior smoothness and clearness.

In actual practice, a composition of a viscosity of 70 to 80 poises for Formula A, for example, is made up and may be kept in stock. In use, the composition may be thinned down by adding the desired solvent, while testing the lacquer with the frame that is to be bridged.

It will be noted that Formula A, having a viscosity of 25 to 35 or 50 poises may be used to bridge openings from 3 to 6 inches. The formula containing the Plastol-Resin has substantially the same rate of drying as Formula A, so that substantially the same viscosity may be used for both. For Formula B, a viscosity of 40 to 50 or 65 will be satisfactory for all openings. Hence Formulas A and B have a common ordinary range of utility of approximately 40 to 50 poises, and a common maximum range of 40 to 65 poises.

It will be clear that the bridging or foundation film may be either an acetate or a nitrate. It is preferred to use an acetate bridging film, because there are fewer solvents that will cut or break an acetate film than a nitrate film.

A reenforcing nitrate coating is applied to an acetate bridging film, and vice versa, so that the reenforcing coating will not cut or dissolve the bridging film. After the nitrate coating is applied, a final top coating of the acetate composition may be applied for additional reenforcement and to avoid the inflammability of the nitrate coating. Any lacquer or other coating material having a viscosity of 2 to 4 poises may be used and will assure smoothness.

A gelatin coating may be used instead of the nitrate and acetate coatings, but it does not afford as smooth a surface. However, gelatin must be applied hot. By way of illustration, a gelatin coating composition having by weight approximately 4 parts of gelatin, 4 parts water, and 2 parts of a drying retarding agent such as glycerine is satisfactory.

While I have specifically referred to openings of 3 to 6 inches in size, it will be understood that the invention contemplates the bridging of larger openings where required. Sufficient information has been given to constitute a guide for those skilled in the art. It may be noted that for openings of 8 inches and larger, I prefer always to make the bridging film of the acetate instead of the nitrate. Concerning the drying quality, this may remain approximately the same, or may be suitably increased or decreased, and viscosities may be indicated by curves based on the data given and which will afford an approximate guide. Viscosities may in general be increased to such a point where it becomes quite difficult to work the process, and removal of the frame from the bath must be practised quite slowly and skillfully to prevent tearing of the film at the surface of the bath; and a free flow of drippings along upright or inclined elements of the frame and away from the film, as at 23, may be provided for to minimize the tearing of the film by the drippings.

In conclusion, it is desired to particularly indicate the variability of certain factors involved

in the film bridging of an opening. Openings of 3 and 4 inches may be successfully bridged with one of the cellulose acetate compositions having a viscosity as low as 4 poises provided that the
 5 reenforcing coating has a relatively small quantity of solvents consistent with the purpose of uniformly applying the coating without tearing the correspondingly thinner film produced. Of course the thickness also varies inversely with the
 10 speed of withdrawal of the film from the bath. The opening to be bridged must be relatively continuously marginally closed, and ought not to exceed two to three feet in length due to the weight of the film tending to overcome its cohesion, and thus for long openings, a relatively
 15 low viscosity within the ranges mentioned may be used to keep down the weight, and at the same time, the drying quality may be increased. The plasticizers are employed in sufficient quantity to increase the bridging quality of the composition as well as to prevent cracking of the film upon hardening due to the tendency to shrinking, and hence a substantial amount of plasticizers ought to be used with low viscosities and
 20 with long openings. It may be interesting to note that the hardened bridging film produced according to my invention may have an elongation beyond its elastic limit of 10 to 25 percent without breaking. Nevertheless, after the film has been covered with a hardened reenforcing coating as herein described, it has a relatively high tensile strength so that it may be considered relatively non stretching. The reason for this is not apparent, except that the coated film
 30 is considerably thicker than the initial film. At any rate, I obtain a novel flexible wall having outer laminations hardened on a relatively soft inner lamination, which acts like yielding core or filler. Because of the necessity for providing relatively uniform characteristics of the frame and for uniform dripping of excess composition, to produce a bubble-like film section, a bridging film may be broken if the opening to be bridged is interrupted by a horizontal cross frame member.
 40 In that case one section of the opening may be bridged by dipping said section as into an acetate, and upon hardening, the second section may be dipped as into a nitrate for bridging, and then protected by a neutral coating, and then each section alternately bridged in a solution neutral to the others such as a gelatinous compound. If the interrupting frame member be sufficiently wide or thick in the plane of the
 50 openings, the withdrawal may be stopped at the axis of the frame member to permit the film to harden, and then the withdrawal may be continued to bridge the opening below the frame member. A high rate of drying ought to be used.

60 I claim:

1. The method of bridging a relatively thin open work frame, having an opening of at least three inches in maximum width, including dipping the frame wholly into a liquid composition
 65 bath, relatively slowly withdrawing said frame from the bath upwardly and with the frame being in an upright plane, to bridge the opening in the frame with the composition being of such high viscosity and drying quality as to cause the bridging film to begin to dry substantially
 70 as withdrawn from the bath, maintaining said bath relatively quiescent during the withdrawal of the frame, and maintaining the atmosphere above the bath substantially free of concentrated
 75 vapors solvent to the film.

2. The method of bridging in a relatively thin open work relatively rigid frame an opening of at least four inches in maximum width, including dipping said frame into a bath of liquid composition of high viscosity and drying quality, relatively slowly upwardly withdrawing said frame in an upright condition from the bath with the bath being relatively quiescent, and maintaining the atmosphere into which the frame is received as withdrawn from the bath substantially
 10 free of concentrated vapors solvent to the bath.

3. The method of bridging a relatively thin open work frame having an opening of at least four inches in maximum width, including dipping said frame into a bath of a composition having a relatively high drying quality and viscosity within the range between 7 and 11 poises and 65 to 100 poises as lower and upper limits respectively, upwardly withdrawing said frame in a generally upright condition from the bath at a
 20 relatively slow rate and while maintaining the bath relatively quiescent, and causing the bridging film produced to be received in an atmosphere including the atmosphere adjacent to the surface of withdrawal from the bath substantially free of concentrated gases solvent to the film.

4. The method of bridging a relatively thin open work frame having an opening of at least four inches in maximum width, including dipping said frame into a bath of a cellulose acetate lacquer composition having a relatively high drying quality and a viscosity within the range between 7 and 11 poises and 65 to 100 poises as lower and upper limits respectively, upwardly
 30 withdrawing said frame in a generally upright condition from the bath at a relatively slow rate and while maintaining the bath relatively quiescent, and causing the bridging film produced to be received in an atmosphere including the atmosphere adjacent to the surface of withdrawal from the bath substantially free of concentrated gases solvent to the film, causing said film to harden and finally coating said film with a cellulose nitrate lacquer composition.

5. The herein described composition dipped article comprising a relatively thin wire like frame defining an opening greater than four inches in maximum width, said opening being continuously marginally closed and being otherwise unobstructed, and a one piece self hardening film hardened on and continuously encasing the frame and bridging said opening to provide a self sustaining film wall interconnecting the frame encasing film portions, said film lying substantially
 55 along the central plane of the frame therealong, and said film being uniformly taut throughout, and a reenforcing relatively non inflammable coating completely adherently encasing said film and frame encasing film portions.

6. The herein described composition dipped article comprising a relatively thin wire like frame defining an opening greater than four inches in maximum width, said opening being continuously marginally closed and being otherwise unobstructed, and a one piece self hardening film hardened on and continuously encasing the frame and bridging said opening to provide a self sustaining film wall interconnecting the frame encasing film portions, said film lying substantially
 70 along the central plane of the frame therealong, and said film being uniformly taut throughout, and a reenforcing relatively non inflammable coating completely adherently encasing said film and frame encasing film portions, said coating
 75

being relatively translucent and having portions of different thicknesses embodying design effects.

5 7. The method of film bridging an opening of approximately at least three to four inches in maximum width, in a relatively thin frame, including dipping said frame into a relatively quiescent bath, of a quick drying liquid acetate lacquer composition having a substantial amount of plasticizers and having a viscosity between approximately 4 poises as a lower limit and an upper limit such that the bridging film will not be broken by the weight of the liquid composition, and upwardly relatively slowly withdrawing said bath in an upright position into a drying atmosphere free of concentrated vapors solvent to the film.

10 8. The method of film bridging an opening of at least three to four inches in maximum width, in a relatively thin continuously marginally

closed frame, and the opening being less than approximately 2 to 3 feet in length, including dipping said frame into a bath of composition having relatively quick drying and high viscosity qualities, said composition having sufficient plasticizer to render the hardened bridging film produced stretchable to a substantial degree, upwardly withdrawing said frame from the bath in a relatively upright position with the bath maintained in relatively quiescent condition, and receiving said film as produced into an atmosphere relatively free of concentrated elements solvent to the film so that the latter begins to dry as produced, permitting said film to harden into taut condition, and finally coating said film in the relatively taut condition with a composition non solvent to the film.

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