Nov. 17, 1936. W. G. STEPHENSON 2,061,294

DISPLAY DEVICE AND PROCESS OF MAKING THE SAME

Filed Nov. 20, 1934

Fig. 1.

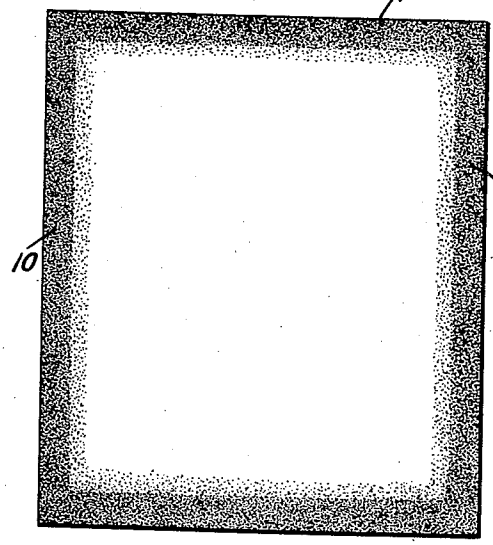


Fig. 2.

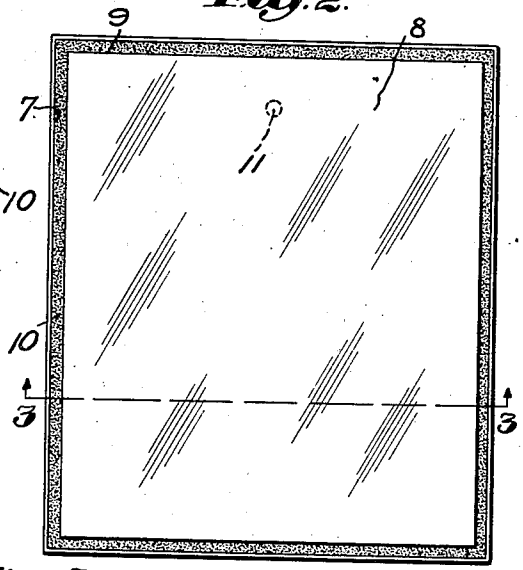


Fig. 3.

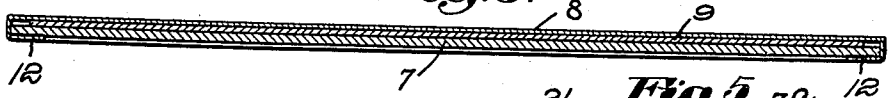


Fig. 4.

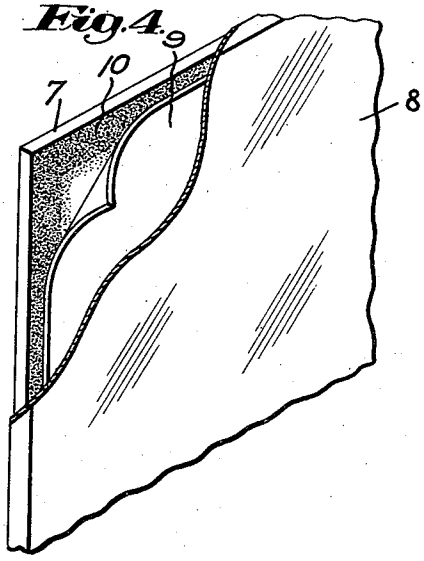


Fig. 5.

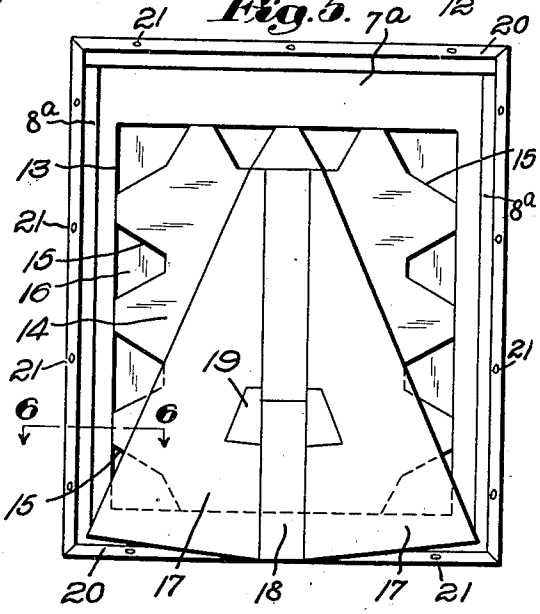
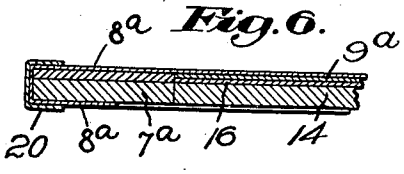


Fig. 6.



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DISPLAY DEVICE AND PROCESS OF MAKING THE SAME

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Application November 20, 1934, Serial No. 754,001

6 Claims. (Cl. 40—125)

My present invention relates to devices for display purposes, such as for advertising and the like, and to a method of making the same. More particularly it aims to provide a simplified and inexpensive means of the class mentioned, of extremely attractive appearance, together with a method of producing such device rapidly and with a minimum of equipment and manufacturing expense.

In the drawing, illustrating by way of example certain embodiments of the product of my invention, as made in accordance with the method thereof.

Fig. 1 is a plan of a backing element, in an initial stage of manufacture of the display device as a whole;

Fig. 2 is a view similar to Fig. 1 but showing a completed display device;

Fig. 3 is a section on the line 3—3 of Fig. 2;

Fig. 4 is an enlarged perspective of one corner portion of the device of Figs. 2 and 3, the front elements being shown partly separated, to facilitate their illustration and description;

Fig. 5 is a rear view of a modified form of device embodying the invention and made under the process thereof; and

Fig. 6 is an enlarged detail sectional view on the line 6—6 of Fig. 5.

In that embodiment of the invention illustrated in Figs. 1 to 4, the device as a whole comprises but two main elements, between which the display sheet or other object is interposed. A backing element, backing or base is indicated at 7, and a transparent front, covering or protecting element is shown at 8, Figs. 2 and 3. Between these is positioned the matter for display, which may include any desired number of pieces, within the area of the backing, and herein represented by the sheet 9.

The backing or base element 7 may be composed of any suitable material which is self-supporting and of substantial rigidity such, for example, as cardboard, paperboard, wallboard, plywood, and similar relatively rigid sheet materials. In actual practice I have found a chipboard to be satisfactory for the purpose, for example, a standard commercial chipboard of about $\frac{3}{16}$ inch thickness. It will be understood, however, that various materials, and of different thickness, may be employed, depending somewhat upon the display area desired and the inherent rigidity of the material used.

Attempts have heretofore been made to provide a front or protective covering, in display devices of this general character, by utilizing a sheet of flexible, transparent, cellulosic material such as commercially sold under the registered trade-marks "Cellophane", "Kodapak", and others. Such transparent cellulosic materials, however, are subject to tensile and other variation under changing conditions of temperature and humidity, such as ordinary atmospheric and weather changes. In general, both heat and moisture tend to cause this material to soften, rumple or stretch, if under tension, while lowered temperature and decreased humidity have the opposite effect and also tend to make the material more brittle. Hence in attempting to provide a transparent cellulosic front or protective covering for display purposes, the practice in most instances has been to apply the cellulosic sheet in sufficiently loose condition to allow for changes of the character mentioned. The result is that during a greater part of the time and under normal conditions the sheet is characterized to an objectionable extent by wrinkles and surface undulations and irregularities. Or if, in accordance with another practice, the cellulosic sheet is initially drawn tight in an effort to relieve it of wrinkles and surface irregularities, changing atmospheric conditions are likely soon to cause a contraction to such an extent that the backing element, even in the case of a heavy chipboard, becomes warped. When the cellulosic sheet reaches the limit of its tensile strength, it breaks or tears generally along a line roughly paralleling its major dimension, often with an accompanying report almost of an explosive nature.

In the development of the process of my present invention and the devices made in accordance with it, I obtain a predeterminedly limited and controlled tensioning of the cellulosic sheet, whereby the objections mentioned are removed and I am able to produce a smooth, flat, transparent protective front or covering surface of substantial permanency and with avoidance of warping of the backing element.

To that end I subject primarily a portion only of the total area of the cellulosic sheet, for example, a marginal portion, that is, a non-central portion of distinctly less than total extent, to the action of a cellulosic solvent, such as any known or suitable agent having a solvent and subsequent contractile effect upon those transparent cellulosic sheet materials under consideration. Among such solvents are the several commercial alcohols, or mixtures thereof, and other cellulosic solvent agents, but preferably I employ a solvent which is distinctly volatile, such as ethyl alcohol, or an acetate or ester, for example,

amyl acetate or ethyl acetate, alone or in mixture with other agents. One preparation which I have found particularly adapted for the purpose comprises a mixture of ethyl acetate to about 90 per cent and ethyl alcohol to about 10 per cent. Other examples effective in practice are a mixture of a major portion of ethyl alcohol with the balance amyl acetate, and a mixture of about 65 per cent benzol, about 25 per cent ethyl acetate and the remainder ethyl alcohol.

The solvent may be brushed on or applied with a substantially saturated sponge, felt dauber, or the like. Preferably, and particularly in the use of the more active and highly volatile agents such as mentioned, the application is made to the front face of the backing 7, as indicated at 10, 10, Fig. 1. The display sheet, piece or pieces 9 are then positioned flatwise upon and against the backing. The matter for display may be a pictorial print, an advertising cut or reprint, printed or pictorial matter of any sort, or substantially any relatively thin and comparatively flat-surfaced material which it is desired to display or to protect in use, and may consist of a single piece or sheet or any desired plurality thereof within the capacity of the backing. The display object 9 (which is herein illustrative of any display piece or pieces) is positioned on the treated backing preferably without a securing adhesive, with the possible exception of one or more small holding spots, such as indicated at 11, Fig. 2, for keeping the object in place until the transparent covering has been applied.

Following the positioning of the display object or objects 9 the transparent, cellulosic sheet 8 is spread out flatwise over it or them, and over any exposed marginal portion of the front face of the backing 7. The liquid portion of the solvent, immediately upon its application to the backing, and the positioning of the display object thereon, has mainly been absorbed by and spread into those elements, leaving little or no free liquid, in puddles or drops, to make direct liquid contact with the cellulosic sheet. The latter is adhesively or otherwise secured in applied position, generally and preferably by folding the cellulosic sheet around the side edges of the backing 7 and gluing, cementing or otherwise retaining it at the rear face of the backing, as indicated at 12, 12 in Fig. 3. If desired, strips of adhesive tape may be used for said purpose.

In thus applying the transparency or covering front 8 no special effort is made to tension it or to smooth out all wrinkles and irregularities. The display device as a whole is then placed in any convenient storage location. There ensues a gaseous or fuming action of the solvent upon the cellulosic sheet, giving its marginal portion overlying the treated area of the backing temporarily a somewhat flaccid state, accompanied and followed by a chemically induced self-shrinking effect in that region. This action in turn is communicated to the adjoining and central areas of the sheet 8 as a mechanical pulling effect. This fuming or volatile action, at least in the case of the more volatile solvents mentioned, is effective even through and around a paper display object covering the treated portions of the backing in whole or in part. It will be understood that the action of solvent vapor upon the cellulosic sheet is strongest at that portion, namely, the marginal portion, of the latter overlying the area of the backing to which the liquid solvent was applied, and from that portion the effect of the solvent vapor is laterally diffused, in decreasing strength, leaving the more remote or central areas substantially unaffected. Moreover, there is no distinct line of demarkation of any of the affected areas of the cellulosic sheet, and hence, after curing, no lines, streaks or the like are apparent on the cellulosic sheet, such as would result in most cases from the application of a liquid solvent directly to the sheet, and for the same reason any objectionable spotting, flocking, clouding or other disfiguring of the sheet is avoided. At the end of the curing or setting period the display device is complete and ready for use. The area of the cellulosic sheet acted on by the solvent fumes resumes its normal appearance and becomes visually indistinguishable from the remainder of the sheet, while the whole exposed portion of the sheet has been given a taut and extremely flat condition, free of wrinkles or other irregularities. Said completed condition of the device is reached after a comparatively short setting period, varying somewhat with the temperature and humidity conditionings of the setting chamber or room, but generally not exceeding six to eight hours, or over night. The length of the curing period is proportional to the temperature and relative humidity, and hence may be shortened in the presence of higher temperature or decreased relative humidity.

In accordance with the invention, the directly treated area of the backing 7 is so determined and proportioned with respect to the total area of the cellulose sheet 8 that the resultant shrinking and tensioning effect is well within the limit of rigidity of the backing and of the normal tensile strength of the sheet, while the untreated area is of such extent that, upon completion of the device, the sheet as a whole retains substantially its normal capacity for expansion and contraction, at least to such degree that it can conform and adapt itself to wide variations in temperature and humidity conditions while still remaining taut and flat. As a result the limit of rigidity of the backing 7, beyond which it would warp, is never reached, under any normal atmospheric or weather conditions likely to be encountered, including variations between the extremes of summer and winter conditions. In other words, the untreated area of the cellulosic material is made sufficient to afford a full compensating effect, while the shrinking action and flaccidity temporarily produced, solely in the marginal or other treated area, are adequate to bring the sheet initially to a predeterminedly tensioned and extremely smooth flat state. I have determined that the desired result is obtained in the majority of instances by primarily treating the backing over a marginal area approximating in all not substantially more than about one-seventh to one-third of the total area of the sheet as a whole. This proportion may be varied within limits dependent somewhat upon the overall size of the backing and the specific material employed for it. However, to cite one specific example, I find that about a five to one ratio as between the total and the treated areas is highly satisfactory in the use of a $\frac{3}{16}$ inch chipboard of sizes from approximately 12 x 16 inches, or less, at least up to sizes of 36 x 48 inches. Thus for a 12 x 16 inch size, of the material mentioned, a marginal portion about one inch wide, or a bit less, would be treated.

In Figs. 5 and 6 I have illustrated a modified form of display device embodying the invention and made in accordance with the method thereof.

The backing 7a, the transparent cellulosic cover or protecting front 8a, and the display object or objects 9a may in all respects not otherwise referred to be the same as in connection with Figs. 1 to 4, and the process of making may be as previously described, particularly as to the step or steps of treating the backing and so predeterminedly shrinking on and tensioning the cellulosic sheet.

As illustrated in Figs. 5 and 6, the display device as a whole is constructed and arranged to provide for removal and replacement of the display object or objects. The backing 7a accordingly is provided with an opening or cut-out portion 13 of a size adequate to permit the introduction or removal of the display material. In the case of a single picture, print or the like, the opening 13 is of substantially the same size as such display object, but where a plurality of individually smaller pieces or objects are to be mounted or displayed, a relatively smaller opening, or a plurality of them, may be used.

In this connection means is provided for retaining the display piece in mounted position and for placing the backing as a whole under similar tension, derived from the contractile marginal shrinking action of the cellulosic sheet, as if the backing were solid, as in Figs. 1 to 4. Any suitable means may be employed for the purpose, one simple and inexpensive form being shown in Figs. 5 and 6, wherein I employ the same section, 14, of the chipboard or other material which is initially stamped, died, or cut out from the backing. This section 14 may be utilized in its original size and shape, but its manipulation is facilitated by cutting out parts of it as indicated at 15, 15, etc., leaving bracing sections or zones of the element 14, both transversely and longitudinally, of their original dimension or substantially so, to serve in the manner of struts. As seen in Fig. 6, a black or other opaque mat 16 may be placed between the print or display object 9a and the removable section 14, to prevent light from showing through at the cut-out parts of the latter. The cellulosic sheet 8a is secured and marginally shrunk into tensioned condition similarly as in Figs. 1 to 4, the removable section 14 being left in position at that time, to afford similar opportunity for the volatile action of the solvent and prevent its premature escape. On subsequent removal of the section 14, the side portions of the backing are drawn inwardly, and are required to be forced back when the removable section is re-inserted. The tension derived from the cellulosic sheet 8a serves to hold said removable element 14 in position, and in that connection one or more buttons or other locking means may be provided although unnecessary.

Supporting means may be provided for the display devices, whether the latter are of the replaceable type, as in Figs. 5 and 6, or as in Figs. 1 to 4. In Fig. 5 I have illustrated one example of such supporting means, formed of a foldable cardboard or like element or easel comprising the opposed wings 17, 17, a central securing strip 18 glued or otherwise attached to the removable section 14, and a slotted locking member or tab 19 adapted to be folded down to hold the wings 17 in outturned position, wherein they serve as a stand or rest for the device as a whole.

In any instance the display device may be provided with a protective or decorative edging. In Figs. 5 and 6 I have shown for the purpose a binding strip or protective edging 20 composed of a light-weight metal channel element adapted to be set over the edges of the display device and there secured as by indenting it at one or more points 21, 21 upon the back. Such edging may be in the form of a single strip bent about the corners of the backing and completely enclosing the same, or it may be applied in shorter lengths.

It will be understood from the foregoing description, referring now to both illustrative embodiments of the invention, that the display object is automatically held in position against the backing, after application of the cellulosic sheet, by said sheet itself, due to the tensioned condition of the latter. Since no substantial quantity of adhesive for retaining the display object or objects is used, little or no moisture, such as contained in most adhesives, is present between the cellulosic sheet and the backing. Hence one of the factors ordinarily tending to affect a cellulosic covering objectionably is removed. And since neither the cellulosic sheet nor the backing has any substantial attachment to the display article, the display means and method of my invention may be utilized for the mounting and display of original, unique and often extremely valuable papers, prints, documents or the like. Numerous other advantages will be apparent, including those of lightness in weight, ease of packing, shipment and handling, and simplicity and inexpensiveness in manufacture. Where I have herein referred to marginal or peripheral portions of the backing or the transparent covering sheet, it will be understood that I refer to regions spaced from the center and of greater or less width but not necessarily disposed at the extreme side edges.

It will be understood that my invention, either as to means or as to method, is not limited to the exemplary embodiments or steps herein illustrated and/or described, its scope being set forth in the following claims.

I claim:

1. The process of manufacturing display devices which comprises the steps of applying a volatile cellulosic solvent agent to marginal portions of a backing element of substantial rigidity, positioning a relatively flat display piece or pieces against the treated face of the backing element, superposing a transparent flexible cellulosic sheet over said display piece or pieces so positioned, and attaching said sheet to the backing in a manner leaving said display piece or pieces otherwise substantially free, and in such fashion that the sheet is subject to the action of said solvent agent primarily at its marginal portions only thereby to produce a tensioning of the sheet as a whole predeterminedly within the limits of rigidity of the backing element and of normal tensile strength of the sheet.

2. The process of manufacturing display devices which comprises the steps of superposing a display element flatwise on a self-supporting backing element of substantial rigidity, applying a volatile cellulosic solvent to one of said elements at a marginal portion only thereof, covering the display element and any adjacent front surface of the backing element with a transparent flexible cellulosic sheet, and securing said transparent sheet to the backing element outside the area of the display element, whereby said volatile solvent has a fuming action, as contrasted with direct liquid contact, upon said transparent sheet and primarily only at that portion thereof opposite said marginal portion of the element to which the solvent is applied, thereby temporarily to flaccidify said portion of the transparent sheet and to induce subsequent limited contraction of

said sheet adequate to smooth and tauten it substantially uniformly.

3. That method of making display devices and the like which comprises covering a display area of a backing element of substantial rigidity with a transparent flexible sheet of cellulosic material, securing the sheet in said position, and applying a volatile cellulosic solvent to the backing element in such manner as to subject the inner face of the transparent sheet to the fuming action of said solvent primarily over a frontal peripheral area not substantially more than one-half the total area of the sheet thereby predeterminedly to tension the latter.

4. That method of making display devices and the like which comprises covering a display area of a backing element of substantial rigidity with a transparent flexible sheet, applying to lateral portions of the front face of the backing element a volatile agent having a solvent action on said sheet, and securing said transparent sheet to the backing element outside the display area thereof, whereby the inner face of the transparent sheet is subjected to the fuming action of said agent primarily over a front peripheral area of the transparent sheet so materially less than its total frontal area as to produce a predetermined maximum tensioning of the sheet within the limits of its normal tensile strength and the rigidity of the backing element.

5. A display device comprising, in combination, a backing element of substantial rigidity, said element having a display area adapted to receive flatwise and to support a flat object or objects for display, and a sheet of flexible transparent cellulosic material overlying the display area of the backing element, said sheet being secured to the backing element beyond the display area thereof, the portion of said sheet overlying said display area comprising a fumed shrunk marginal portion and an untreated central area tautened by said marginal portion whereby the entirety of the sheet overlying said display area has a predetermined and substantially uniform tension and retains its initial condition with respect to flatness and clarity as prior to its incorporation into the display device.

6. A display device comprising, in combination, a backing element of substantial rigidity, said element having an enclosed through cut-out formation, means removably positionable within said cut-out formation and adapted to hold the enclosing portions of the backing element in substantially their original position, against pressure effective inwardly, and a sheet of transparent flexible material at one face of the backing element and covering said cut-out formation, said sheet being secured to the backing element and having a predetermined and substantially uniform tension in said secured position.

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