A clip fixing for retaining thin plastics film material (6) in tension formed of a pair of elongate channel members (2, 4) removably assembled together in inverted relationship. The film material passes through the fixing between opposed cooperating complementary sinuous surfaces (8, 3; 9, 12) of the flanks of the channel members and in so doing passes over surface portions of the fixing at the entrance to the cooperating surfaces of each flank pair, which are exposed to direct radiation. To avoid degradation of the plastics at these surface portions, means (30, 32) are provided on one of the channel members to cover or shield these surface portions from such direct radiation. The covering or shielding (30, 32) may be integrally formed with one of the channel members or removably affixed thereto.
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"A Clip Fixing for Retaining Thin Film"

FIELD OF THE INVENTION

The present invention relates to a clip fixing for retaining thin film material, particularly plastics material, under tension. This form of clip fixing is specially useful in glazing building structures such as greenhouses, home extensions, industrial buildings and solar collectors.

BACKGROUND ART

The use of thin plastics films to form large areas of transparent glazing is becoming an important substitute for glass. This is not only from the cost and weight point of view, but also due to the increased thermal and optical performance that can be achieved with double, triple, and even multiple glazing using this material. Hence thermally efficient structures can now be fabricated at a fraction of the cost and weight of equivalent systems, which use traditional material such as glass, fibre glass or rigid plastics.

A typical panel consists of a framework, usually metal or plastics extrusion, over which the thin film, to form the glazing, is secured and tensioned. Problems have been experienced with this form of glazing mainly due to a short life span brought about by degradation of the plastics material under ultra-violet effects of the sun's radiation, and the lack of an adequate means of securing the film material to the framework.

These difficulties have been overcome to some extent by the introduction of more durable plastics and the use of a special clip for tensioning the thin film to the framework, in a dynamic manner, such a clip being the subject of U.K. Patent 1,586,247.

The more durable plastics film which has been introduced is quite capable of withstanding fairly high temperatures, up to 177°C, for short periods of time with a maximum working temperature of perhaps 80°C depending on film type. It is also capable of lasting for long periods of time, and in excess of fifteen years even when exposed to intense ultra-violet radiation. Under these conditions
the film will show a high enough percentage of elongation to break after ten years' exposure to allow a few more years of useful service (the term 'elongation to break' is presently one of the recognised methods by those knowledgeable in the field of plastics film technology for testing the tensile strength of a plastics film. It is a measure of the percentage elongation that can be applied to the film before it fails). As a plastics film ages under outdoor weathering, the percentage of elongation to break, which may be of the order of 200% for an exposed piece of film, will drop to perhaps 50% after fifteen years, at which time its impact resistance is virtually gone and it will fail with the slightest application of load, i.e. snow, hail, wind, or otherwise.

It has been found, however, that the new generation of plastics films still encounter ageing problems, and it has been shown that the ageing process is most likely to occur in the region where the film exits the clip fixing retaining the thin film at the perimeter of the glazing frame, for example the clip of U.K. 1,586,247 above referred to.

In particular premature failure has been found to occur where the film passes over those surface portions of the clip fixing which are exposed to direct radiation and thus under the influence of high temperatures and ultra-violet radiation.

The result is that such surface portions heat up as they absorb both the infra-red radiation of the sun's spectrum, and also the visible radiation which is converted into thermal energy when it impinges on this part of the clip fixing surface.

On a bright sunny day it is possible for the temperature of the exposed clip fixing surface portions to become substantial. The film passing over the surface is itself therefore elevated to the same temperature, and it is this high temperature coupled with the exposure to ultra-violet radiation that causes the film touching the surface at that point to age extremely quickly, and failures have been recorded within three years on film that would otherwise last for many years.
The result of this simultaneous exposure to U.V. and high temperature being an ageing process which causes the film to become brittle and eventually fail. When tested the value of elongated to break for the film in the region of failure will be below the percentage mark necessary for continuing useful life. Film in very close proximity to this area, however, will still be quite serviceable and when tested exhibit a high value of elongation to break depending on the number of years exposure.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a clip fixing for retaining and/or tensioning thin film which removes, or at least eliminates to a large degree, the above problems.

According to the invention there is provided a clip fixing for retaining thin plastics film material in tension comprising cooperating surfaces of the fixing designed to retain the film therebetween characterised in the provision of a shield arranged to provide protection from direct radiation to those surface portions of the clip fixing over which the retained film passes and is exposed to said direct radiation.

With this arrangement excessive ageing of the thin film in those areas in contact with the clip fixing and normally exposed to direct radiation, is avoided. Preferably the cooperating surfaces of the clip fixing are provided by the sinuous profiles of the cooperating first and second elongate channels of the clip fixing disclosed in the above-mentioned U.K. Patent 1,586,247 incorporated herein by reference.

In this arrangement the shield is attached to the exterior face of the base of the inverted first channel, to overlap the surfaces of the second channel over which the retained thin film passes, upon exiting the clip fixing.

Advantageously the shield may be removable mounted to the first inverted elongate channel. Preferably this is accomplished by forming the shield of a pliable material, within the first channel adapted to receive in compression fit a complementary pliable pro-
tubercane on the shield.

This arrangement is most useful where modification of in-situ existing clips fixings becomes necessary.

BRIEF DESCRIPTION OF THE INVENTION

Embodiments of the present invention will now be described by way of example with reference to the accompanying drawings wherein:

Figure 1 is a sectional view of a retaining and tensioning clip-fixing for thin plastics film according to the prior art;

Figure 2 is a cross-sectional view of a clip fixing for thin plastics film provided with a radiation protective shield according to an embodiment of the invention;

Figure 3 is a cross-sectional view of the clip fixing of Figure 2 showing the components of the clip fixing in the course of assembly;

Figure 4 is a cross-sectional view of a retaining and tensioning clip fixing for thin plastics film according to another embodiment of the invention provided with a radiation protective shield;

Figure 5 is a cross-sectional view of a retaining and tensioning clip fixing for thin plastics film according to another embodiment of the invention;

Figure 6 is a cross-sectional view of a retaining and tensioning clip fixing for thin plastics film according to a still further embodiment of the invention; and

Figure 7 is a cross-sectional view of a more basic clip fixing requiring at least three component parts.

BEST MODES OF CARRYING OUT THE INVENTION

The tensioning clip shown in Figure 1 is the subject of U.K. Patent 1,586,247, and represents the present state of the art.

It comprises a channel 2 in assembly with an inverted channel 4,
thereby to hold in tension a thin plastics film 6.

The channel 2 has a relatively sinuous internal profile, and comprises opposing vertical flanks 8 and 9, with a lower member 11 uniting the two flanks.

The flank 9 has a radiused upper rib portion or knuckle 9a and an intermediate rib 9c on its inner surface, forming a groove 9b between the rib 9a and rib 9c, and finally a groove between the rib 9c and the base member 11.

The flanks 8 and 9 extend upwardly by the same amount, with the flank 8 having an initial portion 8a constituting a ramp inclined toward the interior of the channel 2, this ramp being followed by a groove 8b substantially opposite or facing the rib 9c in flank 9.

The inverted channel 4 comprises two flank walls 12 and 13 joined by a base member 14. The flanks 12 and 13 of the channel 4 have profiles corresponding to the profiles of the flanks 8 and 9 of the channel 2. Thus the flank 12 of the channel 4 has a groove 12a in its exterior surface with the same radius of curvature as the rib 9a.

The groove 12a is followed by a rib 12b having a radius of curvature equal to the groove 9b in the flank 9, a groove 12c adapted to accommodate the rib 9c, and finally a curved end portion 12d adapted to lodge within the groove 9b of complementary curvature.

The flank 13 has the same inclination as the ramp 8a in assembly as shown, and terminates in an outwardly extending locking rib 13b conforming to the profile of the groove 8b in the flank 8.

The clip fixing shown in Figure 1, is in assembly holding under tension a thin film 6. To assume the assembled position the film 6 is received its initial tension by being passed over the lower extremity of the two flanks 12 and 13 of the channel 4, and the channel 4 is then moved so that the rib 9a engages the groove 12a, with the enlarged portion 13b sitting on the top of the flank 8.
with the film 6 interposed therebetween.

The channel 4 is then pivoted on the rib 9a in a counter-clockwise movement, and initial tension in the film 6 is then produced since it is forced to slide over the surface of the rib 9a, and at the end of the pivoting motion the two ribs 12b and 12d are locked into the bottom of the respective grooves 9b and 9d and the ribs 13b in the groove 8b.

With this arrangement it will be seen that, in assembly, the upper surface of the knuckle 9a over which the film 6 passes, is exposed to direct radiation and due to the transparency of the film 6, the sun's rays 40, passing through the film, are caused to heat the material of the clip, this thermal variation being transmitted to the plastics film which in conjunction with the sun's U.V. radiation causes relatively rapid ageing in this area.

This problem is solved by the arrangement shown in Figure 2, wherein the base member 14 of the channel 4, is provided with an integrally formed extension 30 extending over that surface of the knuckle 9a which is in contact with the thin film 6, thereby forming a shield protecting the knuckle 9a from the sun's rays. Even at very shallow angles of incidence it is impossible for the sun's rays to strike the knuckle 9a with which the film is in contact.

The design of the shield 30 has been carried out so that it also further improves the security of the fastening action of the clip.

In the original design shown in Figure 1, the channel 4 is locked in place, as explained earlier, by the interaction of the outwardly extending locking rib 13b on the channel 4 with the locking groove 8b in the channel 2, and the tension imparted to the thin film, causing the locking mechanism to act dynamically by pinching the film even harder between the locking groove 8b and the rib 13b and between the underside of the knuckle 9a and the top of the projecting rib 12b.

Due to the presence of the shield 30, without the use of excessive force, it would be extremely difficult to remove the channel 4.
in the normal way, the normal way being to pivot the upper channel 4 around the knuckle 9a until the flank 13 of the channel 4 clear the top of the insertion ramp 8a of the channel 4, at which point the channel 4 may be lifted clear of channel 2.

If this procedure is attempted with the design shown in Figure 2 incorporating the protective shield 30, the protective shield 30 will collide with the tensioned film 6 making further rotation of the channel 4 difficult, without the use of substantial force.

Another embodiment of the invention is illustrated in Figure 4 which shows the incorporation of an integrally formed protective shield 31 with the channel 4, so shaped that its terminal edge contacts the film 6 in the assembled position of the channels 2 and 4, thereby achieving a tighter seal around the film in order to prevent the possible build-up of foreign matter between the shield and the film, as may happen in the Figure 2 embodiment.

This in no way reduces the effectiveness of the shield as the material in contact with it, and although it will achieve the same temperatures as the shield, is not simultaneously exposed to direct solar radiation.

Using these designs the system is still easily demountable and the film can simply be replaced if required. When the frame is being glazed the upper inverted channel 4 will still be able to rotate into position around the knuckle 9a; the film 6 not being under full tension the protective shield 31 will simply depress the film during the process of glazing, and this is illustrated in Figure 3.

A further embodiment of the invention is shown in Figure 5. Here the protective shield is in the form of a replaceable cap 32 extending across the upper extremities of the flanks 8 and 9 thus shielding both the knuckle 9a and the exposed ramp 8a and exterior surface of the flank 13a of the inverted channel 4, by cap portions 32' and 32'' respectively.

The cap 32 is provided with a protuberance 33 engaging a corresponding complementary recess 34 in the inverted channel 4 in compression.
fit. In this embodiment the cap 32 is made of plastics, rubber neoprene, or even a soft metal such as to provide a deformable protuberance 33 which can be inserted by a press fit action into the recess 14.

Alternatively the inverted channel 4 may be provided with a recess 35 of the design shown in Figure 6 to receive the protuberance 33' formed in the cap 32. In this embodiment the base of recess 35 is oversized in part with respect to the protuberance 33', to enable, after removal of the cap 32, the insertion of a screwdriver or special tool 5 shown in dotted outline in Figure 6, readily to help the inverted channel 4 to be removed from the channel 2 when required, especially when using the thicker range of thin plastic films. This recess can also be used to aid assembly.

The recess 35 is formed adjacent the flank 13 of channel 14, to provide required leverage with screwdriver 5 or special tool in order to remove inverted channel 4 by lifting flank 13 with a clockwise rotation about knuckle 9a.

With the recess 35 positioned adjacent to the flank 13 of channel 14, in order to prevent the possible build-up of foreign matter or wind or ice under the cap at 32', it is necessary to extend the cap as shown at 32'' in order to provide the necessary counter leverage.

Additionally the cap 32 of Figure 5 or Figure 6, is provided with transverse ribs R which act to resist wind pressure tending to lift the cap 32 of the channel 4.

Another embodiment of the invention is shown in Figure 7. This basic clip fixing requiring at least three component parts in a lower channel 36, a cooperating member 37 and either screws or clips to retain parts 36 and 37 in assembled cooperation retaining the film 6. Using this clip fixing type, adjacent glazed frames may be attached to suitable structure using cover strips 38, by means of mechanical fastening e.g. screws 39. To provide the necessary protective shield 30 in this case, it is easier to make it part of the
cover strip 38 and not an integral part of the clip fixing.

The present invention has been exemplified by reference to modification of the clip of U.K. Patent 1,586,247. However, it will be appreciated by those skilled in the art that the invention would be equally useful in other tensioning clips in general use where similar problems of localised degeneration of the thin plastics glazing of film occurs.
CLAIMS

1. A clip fixing for retaining thin plastics film in tension comprising cooperating surfaces of the fixing designed to retain the film therebetween, characterised in the provision of shielding means arranged to provide protection from direct radiation to the or each surface portion of the fixing over which the film passes and is exposed to said radiation.

2. A fixing as claimed in claim 1 wherein said cooperating surfaces are formed between the opposing flanks of a pair of elongate channel members removably assembled together in inverted relationship.

3. A fixing as claimed in claim 2 wherein said cooperating surfaces, at the entrance to a first flank pair of the channel members, between them form a knuckle joint around which the channel members may pivot into said assembled inverted relationship.

4. A fixing as claimed in claim 3 wherein one said surface portion exists at the top of a flank of that channel member receiving the other channel member in inverted relationship, and over which the film passes for retention between the cooperating surfaces of said first flank pair of the channel members, and then the cooperating surfaces of the other flank pair of said channel members.

5. A fixing as claimed in claim 4 wherein said shielding means extends over the entrance to said first flank pair of cooperating surfaces and said one surface portion.

6. A fixing as claimed in claim 5 wherein said shielding means over said entrance is in the form of an outward integral extension of the base of that one of said channel members in inverted relationship within the other of said channel members.

7. A fixing as claimed in claim 6 wherein the terminating edge of said extension is so designed that, in use, it contacts the film passing to the knuckle joint in the assembled inverted relationship of said channel members.
8. A fixing as claimed in claim 4 wherein said shielding means is provided by a cap removably attached to the base of that one of the channel members in inverted relationship within the other one of said channel members, the cap extending over the entrance to each flank pair of said cooperating surfaces.

9. A fixing as claimed in claim 8 wherein the cap has a protuberance held in a complementary recess in the base of said one channel member by press fit engagement.

10. A fixing as claimed in claim 9 wherein said recess is constructed and arranged to cooperate with leverage means for enabling said one channel member, with said cap removed, to be moved out of its assembled inverted relationship with the other channel member.

11. A fixing as claimed in claim 9 wherein said recess is positioned so as to assist the leverage action of said one channel member out of its assembled inverted relationship with the other channel member, around said knuckle joint.

12. A fixing as claimed in claim 9 wherein the cap is provided with transverse ribs for resisting wind pressure tending to lift the cap out of position.

13. A fixing as claimed in claim 12 wherein said cap is made of a pliable material.

14. A clip fixing for retaining thin plastics film in tension substantially as hereinbefore described with reference to and as illustrated in Figs 2-7 of the accompanying drawings.
INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 84/00294

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) 3

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC 4: F 16 B 5/06

II. FIELDS SEARCHED

Minimum Documentation Searched 4

Classification System Classification Symbols

IPC 4 F 16 B; F 24 J; E 04 H; A 01 G; B 44 C

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 4

III. DOCUMENTS CONSIDERED TO BE RELEVANT 14

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IV. CERTIFICATION

Date of the Actual Completion of the International Search 5 10th December 1984

Date of Mailing of this International Search Report 5 22 JAN 1985

International Searching Authority 5 EUROPEAN PATENT OFFICE

Signature of Authorized Officer 90 G.L.M. K. Jansba

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