My invention relates to improvements in upholstered laminated trim panels. Panels of the type to which my invention pertains are particularly adapted for use as trim panels in the interior of closed automobile bodies.

Such a panel comprises generally a foundation board, wadding over one face of the board and upholstery trim material overlying the wadding. The trim material may be fabric, artificial leather, or any other suitable upholstery trim.

To give such a panel an upholstered, padded or tufted appearance it has heretofore been common practice to stitch the trim cloth through the wadding to the foundation board along a line outlining an uncompressed area of wadding. Along the line of stitching the wadding was compressed against the board defining the uncompressed area. This practice possessed the disadvantage of weakening the board along the line of stitching and of opening up the interior of the board to the entrance of moisture thereinto through the stitch apertures. As it was common practice to treat such panel boards so as to render their surfaces moisture resistant the opening up of the interior of the board to the ingress of moisture was particularly undesirable. The stitching also added to the time and expense of fabrication.

My invention involves the compression of the wadding along a line defining an intended embossment and the permanent adhesive securement of the wadding in such compressed state along said line and the adhesive securement of the trim cloth to the wadding along such compressed line. This permanent adhesive securement of the wadding in the compressed state along the line of compression is obtained by saturating the wadding along the line of compression concurrently with the compression thereof.

Saturation is with a thermoplastic adhesive. By thermoplastic I mean adhesive which is fusible or rendered fluid under the effect of heat. This thermoplastic adhesive secures the trim cloth to the wadding and adhesively secures the wadding compacted together along the compressed saturated line of wadding. I do not here make any distinction between a thermoplastic (repeatedly fusible) and thermosetting (setting up following fusible as not to again fuse upon heating) adhesive. Either type may be used. The word "thermoplastic" as I employ it throughout the specification refers to either type.

The necessary qualification here is that the adhesive be heat fusible for the purpose desired.

A further object is to provide the thermoplastic adhesive in the form of strips of sheet material. These strips are arranged, one disposed under the wadding between the wadding and the foundation board and one between the wadding and the trim material each along the line of intended compression and adhesion.

The employment of the thermoplastic strips insures uniform saturation of the wadding along the line desired for saturation compression and adhesion and confines the saturation along each such line within the width of the strip and prevents saturation beyond the longitudinal margins of the strips. As the strips are uniform in width and thickness the saturation of the wadding is uniform along the line of intended compression and adhesion.

The several laminations which make up a complete panel or panel sub-assembly, whichever is being fabricated, is then subjected to a hot die stamping operation which compacts the wadding along the line of the strips and fuses the strips to saturate the wadding throughout along said compacted line to adhesively hold the wadding compacted along the line of saturation and secure the trim cloth through the wadding to the foundation or backing.

If the complete panel is being fabricated it comprises the foundation board, wadding, trim cloth, and two thermoplastic strips correspondingly disposed on opposite sides of the wadding. If the subassembly is being fabricated the foundation panel board will be omitted. A relatively thin backing may be substituted for such panel board or the thermoplastic strips may have a permanent structural character and form backing strips and any other backing may be omitted.

Other objects, advantages, and meritorious characteristics of my invention will more fully appear from the following specification, appended claim, and accompanying drawing, wherein:

Figure 1 is an elevation of a fragment of a panel assembly embodying my invention, Fig. 2 is a cross-sectional view taken on line
3--3 of Fig. 1, Fig. 3 is a cross-sectional view taken on the same line as Fig. 2, through a modified form of construction, and Fig. 4 is a cross-sectional view through a panel sub-assembly embodying my invention.

In Fig. 1 the three layers, namely, the foundation board 10, the wadding 12 and the trim cloth
are the only laminations which are visible. The adhesive thermoplastic strips are not shown in such figure. In Fig. 2, which is a cross sectional view taken on 2—2 of Fig. 1, thermoplastic strips are indicated as 16. One strip is positioned between the wadding and the foundation board. The other strip is correspondingly positioned between the wadding and the trim cloth. Upon this laminated assembly being subjected to the heat and pressure of the die in a stamping press the thermoplastic strip material is fused along the line of pressure and heat and rendered fluid and flows through the wadding and saturates or impregnates the wadding so that the wadding is saturated throughout along such line as indicated at 17. Under the pressure of the die the wadding is compacted along such line and the trim cloth is pressed thereagainst. The trim cloth is adhesively secured to the wadding and the other foundation board through the wadding and the wadding is adhesively secured compacted together along the line of compression.

In Fig. 3 only one thermoplastic adhesive strip 16 is provided. This strip is positioned between the wadding and the trim cloth. In response to the heat and pressure of the die the fluid adhesive is forced down through the wadding to secure the same compacted against the foundation board and to attach the trim cloth thereto along such compacted line. This line of compression and adhesion is preferably of less width than the width of the thermoplastic strip. This strip material is preferably normally flexible. The strip extends in both directions normally away from the line of adhesion in flexible strip form overlying the wadding underneath the trim cloth. It forms a self-sustaining protective element which assists, in giving the proper contour and shape to the embossed design defined by the line of compression. The strip may be of homogeneous thermoplastic material made up in sheet form and cut into strips or it may comprise a strip of fabric saturated with a thermoplastic adhesive.

If the strip comprises an adhesive saturated fabric strip it is preferable that the fabric be loosely woven so as to carry a substantial quantity of thermoplastic adhesive. Scrim, burlap, cheesecloth, netting or the like may constitute this sheet material. This material is saturated until the interstices are filled with the adhesive. There are suitable thermoplastic materials not available in sheet form but these can be used with the fabric to saturate the same and provide thereby a suitable thermoplastic strip.

As two corresponding strips are preferably used as shown in Figs. 2 and 4 one below the wadding and one above the wadding, one strip may be an adhesive saturated strip of relatively tough and heavy material such as calendered burlap and the other strip may be a relatively light flexible material such as an open weave netting. The saturated burlap, tough, heavy, and strong, is preferably disposed underneath the wadding. The corresponding strip of flexible light weight saturated netting is preferably disposed above the wadding underneath the trim cloth.

Such a construction may be employed to provide a sub-assembly as shown in Fig. 4. The wadding and trim cloth with the light weight flexible adhesive saturated strip therebetween and the correspondingly disposed heavy adhesive saturated strip below the wadding may be embossed by a heated die as a pad separate from the foundation board. This sub-assembly may then be mounted on a panel board. With this sub-assembly the panel foundation may be without embossment.

In Fig. 4 there is shown a modified construction wherein the wadding trim cloth and thermoplastic strips form a sub-assembly which may be made up as a pad prior to adhesion to a foundation board. The numbers indicating these elements are those shown in Fig. 2. In this construction the thermoplastic strip may be a loosely woven fabric strip heavily saturated with a thermoplastic adhesive. Such a strip is hereinafter described. In this type of construction the pad is shown as embossed separate and apart from the foundation board and the embossed pad may be spread over one face of the board and adhesively secured thereto. It would not therefore be necessary to use a board capable of being embossed but an ordinary fiber board might be employed as a foundation for this embossed pad.

There is a number of thermoplastic adhesive materials or compounds which may be used for the thermoplastic strips or as saturants for the fabric strips if a fabric strip is used as the structural base of the thermoplastic strip. Different thermoplastic resinous compounds which may be fusible adhesives may be employed. It is only necessary that the adhesive possess certain desirable characteristics.

It is the purpose here to employ the adhesive in sheet form either as a homogeneous structure made up entirely of the thermoplastic resinous compound or as a fabric strip saturated with the thermoplastic adhesive. The thermoplastic adhesive compound must be heat fusible to adhesively secure the laminations together under the effect of heat. It is rendered fluid under the effect of heat to flow into and through the wadding and upon compression of the wadding concurrently with the saturation it adhesively holds the wadding compacted. The adhesive strip must be fusible within a temperature range above maximum atmospheric temperatures and below a temperature which would be injurious to the material of the panel for the time period to which it would be subjected to heat during its fabrication. The temperature range to which the laminated structure is subjected in the die stamping operation may vary from 140° to 450° F. The dwell of the die may vary from a fraction of a second to three seconds.

Being otherwise suitable, the thermoplastic adhesive may be of a reversible or irreversible character. That is, it may be repeatedly fusible or it may be of a thermosetting nature as hereinafter above referred to. It should be resistant to water or any other commonly used cleaning compounds, such as benzene or carbon tetrachloride. It may not be insoluble in all these cleaning compounds but it should be resistant thereto, considering the manner in which such cleaning fluids are commonly applied to panels to clean them.

An example of a reversible thermoplastic resinous material, which though soluble in certain cleaning compounds is not unsatisfactorily so under normal cleaning conditions, is the hydrogen chlorinated rubber compound marketed commerci-
Another example of a reversible thermoplastic adhesive is the resinous material marketed commercially under the trade name of "Vinylite." This material is a polymerization product of vinyl acetate or vinyl chloride. It may be obtained either in flexible strip form or as a saturant for a fabric strip. This product possesses the further advantage of being substantially insoluble in the commonly used liquid cleaning preparations. An example of an irreversible thermoplastic adhesive is zinc chloride urea formaldehyde which in water solution may be used to saturate a suitably absorbent fabric sheet to make up the desired thermoplastic saturated fabric strips. This resinous product might be obtained in plasticized form if greater flexibility is found desirable.

The thermoplastic adhesive as called for in this application is provided in sheet form and cut into strips arranged as described herein to obtain the necessary adhesion and desired saturation. While the strip fuses along the line of heat and compression saturating the wadding and obtaining secured adhesion it preferably extends in flexible sheet form away from such compacted line along the form wall of the embossment so as to give shape and curvature thereto. Through the employment of the adhesive in strip form it is made certain that the adhesive will saturate the wadding only along the line of heat and compression and elsewhere the wadding will retain its desired fluffy padded state.

What I claim:

A laminated embossed trim assembly comprising a layer of absorbent fibrous wadding, a layer of trim material overlying one surface of the wadding, strips of loosely woven fibrous sheet material saturated with a thermoplastic adhesive overlying corresponding portions of opposite surfaces of the wadding, one of said strips being relatively light weight and flexible and disposed between the wadding and the trim material, the other strip being relatively heavy and self sustaining and adapted to assume and permanently retain an embossed design, said laminated assembly being embossed and compacted together along the median longitudinal line of said strips spaced between the longitudinal margins of the strips, said wadding being held adhesively compacted together along said line between said strips by adhesive flowed from the strips onto the wadding along said line, said trim material being adhesively held along said compacted line to the wadding, said strips serving to give form and contour to the wadding and trim material extending away from opposite sides of the compacted line.

PAUL R. ZINSER.