AUSTRALIA
PATENTS ACT 1952
APPLICATION FOR A PATENT (CONVENTION O'K M PLASTICS, INC., of 1601 Pratt Boulevard, Elk Grove Village, Illinois 60007, United States of America hereby apply for the grant of a Patent for an invention entitled "VEHICLE LOAD FLOOR AND METHOD OF MAKING SAME"

which is described in the accompanying complete specification.

The application is a Convention application and is based on the application(s) for patent or similar protection made in UNITED STATES OF AMERICA
on 27th October, 1977 under No. 845,845
in UNITED STATES OF AMERICA
on 18th October, 1978 under No. 951,031

Our address for service is care of DAVIES & COLLISON, Patent Attorneys, of 1 Little Collins Street, Melbourne, in the State of Victoria, Commonwealth of Australia.

Dated this 25th day of October, 1978

K. M. Dimington

(a member of the firm of DAVIES & COLLISON) for and on behalf of the applicant.

To: THE COMMISSIONER OF PATENTS
Davies & Collison, Melbourne and Canberra.
COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952-1960

DECLARATION IN SUPPORT OF CONVENTION APPLICATION
FOR A PATENT OR PATENT OF ADDITION

(The declaration shall be made by the applicant, or, if the applicant is a body corporate, by a person authorized by the body corporate to make the declaration on its behalf.)

In support of the Convention Application made for a patent for an invention entitled

VEHICLE LOAD FLOOR AND METHOD OF MAKING SAME

I, 

Lester Klenk
K & M Plastics, Inc.
1601 Pratt Boulevard
Elk Grove Village, Illinois 60007
United States of America

do solemnly and sincerely declare as follows:

1. (a) I am the applicant for the patent or (b) I am authorized by K & M Plastics, Inc., 1601 Pratt Boulevard, Elk Grove Village, Illinois 60007 U.S.A., the applicant for the patent, to make this declaration on its behalf.

2. The basic application as defined by Section 141 of the Act was made in the United States on the 27th October, 1977, by Alva Ernest Fogle, Jr., William E. Brennan and P.T.O., and in the United States on the 18th October, 1978, by Alva Ernest Fogle, Jr., William E. Brennan and Jacque Passino.

3. (a) We are the actual inventor(s) of the invention referred to in the basic application, or (b) Alva Ernest Fogle, Jr., 460 Trinity Court Buffalo, New York 14228; William E. Brennan, 2188 Lancer Drive, Troy, Michigan, USA; Jacque Passino, 440 Commerce Road, Orchard Lake, Michigan, USA, are the actual inventor(s) of the invention and the facts upon which the applicant is entitled to make the application are as follows:

Assignment Deed of October 31, 1977 and Assignment Deed of October 18, 1978, whereby the applicant is the assignee of the said actual inventors.

4. The basic application was referred to in paragraph 2 of this Declaration and the first application was made in a Convention country in respect of the invention the subject of the application.

Elk Grove Village, Illinois
Declared at U.S.A. this 18th day of October, 1978

President

Note: Initial all Alterations.
1. A load floor especially for the core of a fold down vehicle seat or the like automotive structural member comprising a hollow blow-molded member of synthetic resin whose overall thickness is substantially less than its size, including a pair of generally parallel walls having a peripheral connecting wall joining them around the member, a plurality of tying links extending between the parallel walls on the interior of the member and comprising each such link being integral with a first parallel wall and comprising an indented formation having a bottom which is generally parallel with said first parallel wall from which the indented formation extends, the depth of the indented formation being such as to carry...
the said bottom into engagement with the interior surface of the second and opposite parallel wall and forming a web therewith which is approximately twice the thickness of either of the parallel walls, the indented formation being produced during the blow-molding operation whereby the said bottom and the said portion of the respective parallel walls are permanently welded together, said tying links being distributed generally throughout the member whereby to rigidify and strengthen said member and said member having means to accommodate if not enable securement of automotive hardware.

31. A method of forming a load floor as a hollow member having a pair of opposite generally parallel walls spaced apart and a narrow peripheral wall joining the opposite wall, indentations in at least one of said parallel walls extending to the opposite wall defining tying links therebetween, said method comprising blow-molding by providing a mold which has one part with projections of the size and configuration to form the indentations of the load floor, the height of the projections being selected each to form an indentation whose bottom welds to the opposite wall to produce a web having a thickness twice that of either parallel wall whereby to form said tying links, bringing the mold parts together upon a parison during the molding process separating the parts subsequent to the molding process and removing the load floor.
Name of Applicant: K & M PLASTICS, INC.

Address of Applicant: 1601 Pratt Boulevard, Elk Grove Village, Illinois 60007, United States of America

Actual Inventor(s): ALVA ERNEST FOGLE, JR., WILLIAM E. BRENNAN and JACQUE PASSINO

Address for Service: DAVIES & COLLISON, Patent Attorneys, 1 Little Collins Street, Melbourne, 3000.

Complete specification for the invention entitled:
"VEHICLE LOAD FLOOR AND METHOD OF MAKING SAME"

The following statement is a full description of this invention, including the best method of performing it known to us :-
ABSTRACT

A blow-molded load floor especially for use as a fold down multi-purpose vehicle seat back core and a method of making same.

The load floor is blow-molded in a type of mold which provides indented parts in one or both walls that are of such depth as to engage and weld with the inner surface of the opposite wall or walls of the load floor or with similar indented parts which are formed in the opposite wall or walls. The load floor has the indented parts generally distributed about the area of the load floor thereby forming transverse tying links between the opposite walls thus giving the load floor great strength.

The tying links can be provided specifically at any location of the load floor, in suitable size and configuration at places where hinges, connectors, brackets or plates are to be secured.

One embodiment described includes an elongate member reenforcing member incorporated therein during blow-molding to become a permanent part thereof.

A method is described which prevents the reenforcing member from disturbing the finished product after molding is completed.
The field of the invention generally comprises automotive structural members known as "load floors", a term generally applied to a core or bracing plate that is inserted into or connected with the back of a vehicle bench seat and intended to be folded down for carrying loads. This core or bracing plate must furnish sufficient strength to the seat back that the latter is safe in the event of shocks and accidents and will not yield, bend or collapse. The core must provide the connections to enable the seat back to be mounted in erect or angled position while the seat is being used by passengers. Additionally, the core must provide hinge means needed to enable the folding of the seat back between the two positions in which it is intended to be used. Still further, the core must provide anchoring means for the various brackets required to connect the seat back in its floor position, either alone or with other members. The core or bracing plate must be strong, sufficient enough to support any kind of load which can be accommodated in the vehicle without yielding or collapsing.

Other requirements of such an article include durability, lightness in weight and capability to be produced economically to enable a vehicle builder to incorporate the load floor into a vehicle of low selling price.

Prior available load floors have been constructed of steel and/or, more recently, of aluminum (as an attempt to lighten the load floor).
Known load floors of the type concerned herein have been fabricated of many parts and pieces, using welding and fastening techniques. Ribs are provided for strength, either pressed into the metal plate or welded onto the same. Attachment of hinges, connectors, brackets and the like complicate and increase the cost of manufacture. Metal load floors require special tools, dies and fixtures for fabrication which increase the capital expenditure required. Differences, say in models of vehicles, call for such design differences as to greatly increase the required expenditure.

Notwithstanding the modern production methods available, load floors are heavy, expensive, and have a tendency to distort through use. When subjected to great weight over a period of time in use as a floor or as a seat back, metal cores will bend and retain the distortion.

Structural members for vehicles are known to be formed from molded synthetic resins. Such members have been formed of fiberglass reenforced epoxy resins, either molded in forms and cured therein, or applied in multiple laminas. In the event such members are intended for uses wherein they are subject to stress, they must be fabricated in situ by known techniques or constructed in much the same manner as metal members, usually manually. Conventional production methods call for the construction of large molds into which the layers of fiberglass and the resin are alternately laid after which the article is cured.
Notwithstanding such techniques, it is believed that there are no members of fiberglass-reenforced epoxy resins, or even of the resins themselves which are completely enclosed and hollow. This type of molding is even more expensive than metal fabrication and not as strong and durable.

In addition to use as the core of a fold down vehicle seat, the load floor may be employed in vehicle doors which must support glass panes and mechanisms for raising and lowering the same and side panels which serve as doors or vents without glass and which must be operated. Any parts which are required to be strong and durable and which carry equipment and accessories advantageously may employ the load floor and techniques of manufacturing same as disclosed herein.

Accordingly there is provided a load floor especially for the core of a fold down vehicle seat or the like automotive structural member comprising a hollow blow-molded member of synthetic resin whose overall thickness is substantially less than its size, including a pair of generally parallel walls having a peripheral connecting wall joining them around the member, a plurality of tying links extending between the parallel walls on the interior of the member and comprising each such link being integral with a first parallel wall and comprising an indented formation having a bottom which is generally parallel with said first parallel wall from which the indented formation extends, the depth of the indented formation being such
as to carry the said bottom into engagement with the interior surface of the second and opposite parallel wall and forming a web therewith which is approximately twice the thickness of either of the parallel walls, the indented formation being produced during the blow-molding operation whereby the said bottom and the said portion of the respective parallel walls are permanently welded together, said tying links being distributed generally throughout the member whereby to rigidify and strengthen said member and said member having means to accommodate if not enable securement of automotive hardware.

Further there is provided a load floor wherein one of said indentations extends a substantial distance along the length of said load floor and has a channel shaped reinforcing member of metal locked to the bottom and sides thereof.

Further a method of forming a load floor as a hollow member having a pair of opposite generally parallel walls spaced apart and a narrow peripheral wall joining the opposite wall, indentations in at least one of said parallel walls extending to the opposite wall defining tying links therebetween, said method comprising blow-molding by providing a mold which has one part with projections of the size and configuration to form the indentations of the load floor, the height of the projections being selected each to form an indentation whose bottom welds to the opposite wall to produce a web.
having a thickness twice that of either parallel wall whereby to form said tying links, bringing the mold parts together upon a parison during the molding process separating the parts subsequent to the molding process and removing the load floor.

Additionally, the method further includes the incorporation of a metal reenforcing member as a permanent part of the load floor locked into one of the indentations by the additional steps of forming one of said projections of dimension smaller on its end and sides than the other projections by an amount substantially equal to the thickness of the reenforcing member, laying the reenforcing member onto said one projection and fixing same into position, thereafter bringing the mold parts together upon the parison, said reenforcing member being permitted to slide during cooling of the load floor subsequent to the molding process to effect locking of said reenforcing member thereto.
Figure 1 is a relatively simple diagrammatic view showing the layout of seats in a station wagon vehicle in order to illustrate the location of a seat back core intended to serve as a load floor additionally.

Figure 2 is a front elevational view of a fragment of a seat back core constructed in accordance with the invention.

Figure 3 is a rear elevational view of the same.

Figure 4 is a fragmentary sectional view taken generally along the line 4-4 of Figure 2 and in the indicated direction on a much larger scale.

Figure 5 is a vertical sectional view taken generally along the line 5-5 of Figure 2 and in the indicated direction on a somewhat larger scale.

Figure 6 is a fragmentary sectional view taken generally along the line 6-6 of Figure 3 and in the indicated direction.

Figure 7 is a fragmentary sectional view taken generally through a modified form of the invention to show a tying link of a type different from that shown in Figure 6.

Figure 8 is a fragmentary elevational view of a modified form of the invention to show a variation in the kind of indentation used.

Figure 9 is a fragmentary top plan view of a modified embodiment of the load floor constructed in accordance with the invention.
Figure 10 is a sectional view through the load floor of Figure 1 along the line 10-10 and in the indicated direction.

Figure 11 is an enlarged fragmentary sectional view taken generally in the same manner as Figure 10 but showing a modified form of the invention.

Figure 12 is similar to Figure 11 but of still another modified form of the invention.

Figure 13 is a diagrammatic top plan view of a load floor of modified form and showing the manner of mounting two steel reenforcement members in the core.

Figure 14 is a diagrammatic top plan view similar to that of Figure 13 but showing another arrangement for mounting the steel reenforcement members.

Figure 15 is a fragmentary sectional view through one part of a mold for blow-molding a load floor showing the construction of molding surface of the part for carrying a reenforcing member and showing the member in exploded disposition as it is being installed into the mold part; and

Figure 16 is a fragmentary perspective view of the mold projection at one end thereof showing the construction to enable the reenforcing member to slide during the curing of the load floor.

The load floor contemplated herein is intended to deflect under pressure which gives it great strength, the flexure being effected by resilience and being followed by recovery. In contrast, metal members assume a permanent set if deflected.
Deflection increases with the length of the load floor. In the load floors which are intended for vehicles larger than so-called compact cars, this deflection may be undesirable. Even in smaller vehicles it may be desired to limit the deflection or prevent it entirely.

As stated previously, the invention herein is considered with the load floor particularly for automotive vehicles formed by blow-molding techniques and having unusual strength and other advantages.

The strength is achieved by the use of tying links which are automatically formed in the member during its molding process and by distributing these links generally about the member. This use of such tying links combined with the box sections resulting which are achieved by the blow-molding technique produce the unusual advantages. The product is rigid enough to support all of the weight that can be supported by metal load floors and more; it flexes and absorbs shock without setting; it cannot rattle or lose its integrity as in the case of metal load floors because there is nothing to get loose, the member being an integral article; it cannot injure passengers because it can be made without sharp edges; it can be exposed because it can be molded with a surface texture and finish not requiring further processing; it is light in weight; it is economical.
Blow-molding as referred to herein is a technique which has been developed in relatively recent times wherein a charge of plastic such as a polymer which is readily converted into a plastic taffy-like consistency, is extruded from a so-called head in a tubular form depending vertically from the head. This form is called a parison and the extruded amount of plastic is adjusted to equal that used in the finished article with allowance for flash and similar slight waste. The bottom end of the parison is open but may be closed by pinching before molding if needed because of the shape to result to enable some inflation before the dies close.

After the parison has been discharged completely, but while still depending from the head the opposite sections of a vertically split two-part mold are tightly brought together with the parison captured between them. The mold completely encloses the parison but for a passageway for air. This passageway may be provided by a nozzle depending from the head, it may be provided in a nozzle that is mounted to be surrounded by the closing mold at the bottom of the blow-molding machine, it may be provided by a side nozzle carried by the mold or it may be a small opening in the mold through which a fine needle or the like has been inserted after the mold parts are brought together. Air may be admitted while the parison is formed or slightly after its formation and before the mold parts are brought together in order to shape the parison more geometrically to meet the general shape into which it will eventually be
formed precisely. This would be the case where the final shape is a radical change from the cylindrical form of the parison and requires the bottom end of the parison to be pinched together to enable pre-expansion.

After the mold closes, admission of air into the tubular length expands the plastic resin into the mold, the extruding process having been discontinued when the mold closed. After the plastic has set, the mold is opened, the air pressure being discontinued at any convenient time, and the finished product is removed. There is usually flash of a small amount around the parting line of the mold and this is readily trimmed off, either by means of a band saw or manually, depending upon the nature of the article. The plastic is still hot enough to enable this to be done easily and quickly.

Thereafter the process is repeated.

Obviously there is no need for layering any materials in the mold, no curing, no handling of dangerous and volatile materials, no fabricating and no requirement for metal working tools and dies. One mold does everything.

Referring now to the drawings, in Figure 1 there is illustrated a layout in the compartment 9 of a so-called station wagon 10 which is relatively large in this instance, but could have two seats instead of the three shown. The front or driver's seat 12 has a seat back 14 which is usually hinged for some movement but
not intended to be laid flat. It could have a core but this is not necessary. The passenger seats 14 and 16 are provided with seat backs 18 and 20 respectively which are intended to be laid flat when it is desired to use the station wagon 10 for carrying goods. Various constructions provide for one or both of the seat backs 18 and 20 to be laid flat and include various types of connectors, brackets, hinges and the like connected to the bottom of the compartment 9, the side walls, etc. None of these is shown since there are so many variations. The mechanisms may provide for sliding of the seats 14 and/or 16 to achieve the desired load-carrying capacity and compartment configuration.

The rear faces of the seat backs 18 and 20 will normally be uppermost in the compartment 9 when the seats are arranged to be laid flat and it is required that the interior of the seat backs be provided with a rugged core that can serve as a floor. The cores are shown at 22 in phantom lines in Figure 1, these being concealed within the seat back and covered with some kind of material such as carpeting or metal or could be exposed in which case they would be finished in a color and texture to match the decor of the vehicle.

The invention is concerned with the construction of these cores 22 as an example which shall be referred to hereinafter as load floors 22. For example, the doors 24 and 26 might advantageously be made of load floors formed in accordance with the invention.
Looking now at Figure 2 there is illustrated the left half of a load floor 22 constructed in accordance with the invention, the right half being identical. The view is called an elevational view in the drawings because while the thickness of the load floor 22 is about an inch (2 1/2 centimeters) for the example to be detailed, the vertical dimension is about 21 inches (54 centimeters) and the horizontal dimension is about 49 inches (1 1/4 meters) the normal orientation of the load floor 22 is generally vertical being usually canted. When in use as a floor it will be laid flat and the surface seen in Figure 2 will be the bottom while the surface seen in Figure 3 will be the upper one.

The load floor 22 is formed of a fully enclosed (but for a small blow hole) hollow plastic article which is integrally formed by blow-molding techniques. There is a front wall 28 which will normally be hidden by the upholstery of a seat cushion of the seat back such as 18 or 20, a parallel rear wall 30 which will have the load engaged thereon. The front surface is designated 32 and the rear surface is designated 34. In the particular model shown there are wings 36 at the upper corners of the load floor 22. A peripheral wall 31 connects the parallel walls 28 and 30 completely around their edges.

The load floor 22 has a series of indentations 38 which are formed in the front wall 28 and hence are discontinuances in the plane of the front surface 32. As
seen in Figure 2 these indentations 38 are relatively evenly spaced frusto-pyramidal indentations that are distributed over the entire surface 32. There are twenty complete indentations 38 on the left side, an irregular shaped indentation 38-1 at the curve 40 below the wing 36, two complete indentations 38-3 in the center and there will also be a repeat of the twenty complete indentations and the irregular shaped 38-1 on the right side.

The indentations 38 are formed by providing suitable protrusions of frusto-pyramidal shape in one of the mold parts which close around the extruded parison tube described above. The dimensions of the protrusions are chosen so that the height is sufficient to bring the bottom end 40 (Figure 4) thereof into engagement with the inner surface 42 of the wall 30 while the resin is hot and plastic. As a result there is a welding of the said bottom 40 to the wall 30 and a thickened connection is formed.

When cooling takes place, the resulting formation 44 comprises a rigid tying link or beam extending between the parallel walls 28 and 30. This means that there will be forty-two such tying links of frusto-pyramidal configuration and two irregular shaped links formed by the indentations 38-1 between the parallel walls 28 and 30. This results in a light weight, hollow, extremely strong structure that can carry considerable weight. Furthermore, the structure will flex to some extent which means that it
can readily resist shocks; nevertheless the flexure will not result in any permanent set being effected in the load floor 22.

Samples of load floors constructed as described and of the dimensions indicated have passed all safety standards tests and weight tests of the automobile manufacturers to which the same have been subjected with results as favorable as and in some instances more favorable than those of metal load floors of the same general dimensions intended for the same models of vehicles.

The thickness of the sections 40 are about 5 millimeters comprising an approximately doubling of the normal wall thickness. This is achieved in a blow-molding process where the normal technique calls for the wall thicknesses to be substantially uniform all over the article being formed.

The securement of hinges, brackets, connectors and the like is a relatively simple matter with the load floor construction of the invention. The plates to be secured can be set into depressed or decreased thickness areas by the ready expedient of building the depression into the mold. This is done without sacrificing the strength of the member.

Thus, a fastening member in the form of a plate, comprising half of a hinge or the like, may be expected
to be secured on opposite lateral ends of the load floor 22. A securing area is formed at 46 which is spaced below and parallel to the surface 32, being joined to the surface by the angled joint 48 surrounding the securing area 46 and blending by relatively smooth curves, if desired. The joint 48 is nothing more than a continuation of the wall 28 and of the same thickness as is the upper wall 50 of the securing area 46.

The plate or other member to be attached can be suitably perforated for screws of threaded bolts (none of which is shown) and these screwed into nuts 52 that are molded in place as inserts in the wall 50. The mold forming the load floor 22 will have suitable structures for forming the anchors 54 for the nut inserts 52. A simple technique of effecting this can comprise providing pins in the mold with the nuts engaged on the pins. After the mold is opened, the load floor 22 is pulled off the pins with the nuts permanently secured.

The portion of the load floor 22 where the plates or hinges are to be fastened at the areas 46 can be located such that it is impractical to provide the strengthening effect of the depressions which are designated 38. It will be noted that the reason for the depressions 38 being pyramidal is that the cross-section of the tying links 44 formed thereby in a plane parallel to the walls 28 and 30 at the thickened bottom end 40 is square. This provides the maximum area of connection
for any given geometric configuration whose maximum
dimension is one side of the square. The result is a strong
box section beam.

In the case of the area 46 in the immediate
vicinity of the three nut inserts 52 shown, the frusto-conical
depression 54 in the wall produces a tying link 56 and a
thickened bottom 58 which substantially strengthens the
load floor 22 at this critical location. The configuration
of the tying link 56 is such that it can be brought very
close to all three of the circularly disposed inserts 52.
The dimensions of a practical device can be proportionally
determined from those given above and applied to Figure 4
to note that the diameter of the upper entrance 60 of the
depression or indentation 54 is slightly more than 4.0
centimeters.

In Figure 2, there are two plaques seen at 62
and 64 these being the thickened rectangular plates
integ rally formed during the blow-molding process normally
to strengthen the load floor 22 at locations where latches
or brackets are to be secured on the opposite face of the
member 22. Thus, the plaque 62 is congruent with the bottom
of the rectangular depression 64 and actually comprises the
bottom floor of that depression. A bracket or latch plate or
other hardware is intended to fit in the depression 64,
well below the surface 34. The depression forms side walls
66 and 68 which are tapered and connect with the wall 30
as best seen in Figure 5.
The same arrangement is provided at the bottom of the load floor 22 where the plaque 64 is located. It comprises the thickened bottom wall produced by the depression 70 that is formed in the front wall 30. Note that the particular design provides for the bottom of the entire load floor 22 to be tapered as at 72 which is no problem at all in the blow-molding process since it merely means a modification of the mold from what it would be if the bottom edge were relatively squared off as the top edge 74.

In the case of the depression 64, the hardware article that is to be accommodated is intended to be secured to the load floor 22 by means of screws or bolts that are to be threaded into the nut inserts 76 and 78 that are molded into anchor formations such as 80 (Figure 6) which are similar to the formations 54. The inserts 76 and 78 are disposed on opposite sides of the depression 64 alongside of the side walls thereof, somewhat spaced from the nearest frusto-pyramidal formation 38-5 and its tying link. While it is true that the side walls such as 66, 68 and those not seen in section in the views but provided at 82 and 84 (seen in elevation) are connected between the parallel walls 28 and 30 in the same manner as the tying links such as 44. For additional strength, smaller tying links may be provided immediately adjacent to the inserts 76 and 78. Thus, relatively small diameter cylindrical indentations 86 are provided as shown in Figures 3 and 6.
producing small tying links 88 having thickened floors 90 where they are welded to the wall 28 during the blow-molding process. The depressions 86 are shown as slightly frusto-conical since preferably they are tapered to provide the necessary draft for easy mold separation.

There are no inserts illustrated adjacent the depression 70 since it can be presumed that this formation is to clear some hardware that is otherwise secured external of the load floor 22. Certain forms of the invention could have the required inserts and strengthening tying links.

The invention can be embodied in load floors of a great variety of configurations and having many different types of hardware secured. Likewise tailgates, doors, panels carrying accessories and equipment and the like can be constructed in accordance with the invention. The blow-molding process applied in the manner disclosed provides unexpected strength to such members.

It is clear also that the tying links need not be formed fully in one of the walls and not in the other. In the case of a load floor such as described it is convenient to have as few indentations and impressions as feasible in that surface which faces up for obvious reasons. In a member where there is not of great consequence, or even in areas of a load floor where it is not important, the tying links can be formed partially in each of the walls of the hollow member during the blow-molding process.
In Figure 7 there is shown in section a fragment of a structural member 90 which has a front wall 92 and a rear wall 94 each of which is provided with an indentation such as 96 and 98, respectively, of substantially the same geometric configuration and alignment. Each indentation 96 and 98 extends halfway into the member 90 and the dimensions are chosen so that during the blow-molding process the bottom touch and weld together to form the double thickened web 100. The resulting tying link 102 is of different formation than a link such as 44 or 88 or 56 but serves the identical function - to provide a beam or transverse structural member strengthening the resulting article. The sectional configuration could be square, circular, etc.

In Figure 8 there is illustrated a plan view of a fragment of a structural member 104 in which the depression 106 is rectangular instead of square in section thus demonstrating a modified form of the invention. The depression could be of any geometric configuration which is convenient or economical to make so long as there is a touching of the bottom such as 108 with the interior surface of the opposite wall to weld together.

A typical blow-hole as required in blow-molding is shown at 110 in Figure 3.

The specific resins preferred in blow-molding structural members intended to take rather heavy punishment are high density polyethylene and polypropylene but these are not to be considered as limiting the scope of the invention.
Referring to Figures 9 through 16 inclusive, a modified embodiment of the invention is illustrated, the same differing from load floor 22 primarily in having a reenforcing steel structure molded into the load floor permanently during the molding process.

In Figure 1 and its sectional view in Figure 2 are shown load floor 10' and has a front wall 112 provided with indentations of several types and a planar rear wall 114. The front and rear walls are connected by a peripheral wall 113 all around.

The rear surface 116 is plain in this example. The indentations include frusto-pyramidal indentations at 118 along the upper edge, transverse elongate rectangular indentations at 120, and an elongate rectangular indentation 122 which extends throughout the majority of the length of the load floor 10'. All indentations are tapered towards their bottoms and each results in a doubled thickness of the plastic walls 112 and 114 where they come together and are welded in place during the molding process as heretofore described.

These indentations all provide the connecting links which tie the walls 112 and 114 together, a typical tying link being indicated at 124 and being formed by the surrounding walls of the indentation 118. The tying links of different shaped indentations will generally follow the shape of the indentation. Thus, the tying links of the rectangular indentations 120 comprise rectangular
formations 126. There may be smaller indentations such as at 128 providing smaller tying links at locations 130 where hardware is intended to be secured.

The indentation 122 extends substantially along the entire length of the load floor 10' and is a steel reenforcing member 132 locked into its side walls, having been molded into load floor 10' at the time of its formation. The member 132 is of channel construction and may be stamped or bent from cold rolled sheet steel of 14 gauge steel (.0747" thick). The channel side arms 133 are bent outward as best seen in Figure 10 to conform closely to the tapered configuration of the indentation 122. The dimensions are chosen so that the depth of the channel member 132 is substantially less than the depth of the indentation 122 so that when molded there will be plastic material engaging along the free edges of the channel arms 133. This results in the locking engagement which prevents removal of the reenforcing member 132.

In a practical example, the depth of the indentation 122 measured along the angled side walls was about seven eighths inch while the equivalent dimension of the side arms 133 of the reenforcing member 132 was about one half inch, resulting in a blocking bead or formation 134 about three eighths of an inch wide along the entire length of the reenforcing member 132.

In the blow-molding of relatively large elongate members such as the load floor of the invention,
shrinkage occurs to a high degree in the direction in which parison has been formed. Logically, the parison is blown in the long dimension of the load floor. The shrinkage resulting during the curing of the molded object can be as much as .018 inch for each inch of length. Considering that a typical load floor will extend across the interior of a vehicle cab and have a length of 50 inches and more, the shrinkage can amount to nine tenths of an inch. Steel expands heat and contracts with cold, but the contraction during the molding process is insufficient to match the shrinkage of the resin.

Since it is essential that the steel reenforcing member be locked into the load floor, the problem of preventing the core from bowing seems insurmountable. According to the invention, the construction of the reenforcing member and the manner in which it is placed in the mold during the molding process obviates this problem by permitting the member to slide relative to the load floor during curing.

It will be noted that the indentation 122 is substantially greater than the length of the member 132 so that there is a free portion at 136 formed at opposite ends of the indentation 122. This space is provided primarily to enable the sliding movement of the member 132 during the curing of the load floor 10' which occurs primarily after it has been removed from the mold and is cooling. This freedom to slide prevents the reenforcing member 132 from
being forced against any part of the load floor 10' which could result in bowing of the core or separating the walls.

In Figures 11 and 12 two different constructions are shown. The core 10" of Figure 3 uses a reenforcing member 132' which is similar in construction to the member 132 in that it has the outwardly bent channel arms 133' to conform to the walls of the indentation 122' but in addition, has small lips or flanges 138 along the free edges of the channel arms. With this form of reenforcing member, when molded there will be a more positive locking action because of the formation of the pockets 140' by plastic that tries to follow the contours of the member 132'. It should be realized that in blow-molding the parison is a tube of plastic having a substantially uniform wall throughout and when that wall is blown into a mold it tries to follow every contour of the mold. As will be explained, during the molding process the reenforcing member 132' is acting as an integral part of the mold and the parison wall will envelope the same and produce the locking pockets 140' on opposite edges of the member 132'.

The load floor 10" of Figure 12 uses a reenforcing channel member 132" that has substantially ring angle arms 133" each provided with a small lip 138" that is locked into a pocket 140" during the molding of the load floor 10" in the same manner as the load floor 10".

Figures 11 and 12 are on a larger scale than Figure 10 so that it is more readily seen that the tying links produced by the indentations are formed at locations...
where the bottom ends of the tying links will weld to the opposite wall and form a double thickness thereat. Thus, the indentation 122' produced an elongate tying link 142' that extends the majority of the length of the load floor 10" and has the thickened portion 144' at its base.

In molding the load floor 10', 10" and 10" where, for example, all of the indentations are formed in one wall of the core and the other is substantially unindented, the mold will be made out of two parts, one of which is flat-faced and the other of which has projections. In Figures 15 and 16 there are illustrated fragments of a mold which has the projections. In the views, the projection 150 is intended for one of the indentations 118, for example, and the projection 152 is intended for the indentation 122 or 122'. These are formed solid with the body of the mold 154 and will be of suitable configuration and dimensions to provide the desired indentations.

The projection 152 has the same contour and dimensions at its ends as the projection 150 thereby providing for the indentation ends to produce the free space at 136 mentioned above and indicated in Figure 9. This forms a slight protuberance 156 at each end of the projection 152. The depth of the protuberance 156 is approximately the same as the thickness of the channel shaped reenforcing member which is to be mounted to the projection 152.
In fabricating the mold part 154, the projection 152 can be cast or machined from the block or can be formed separately and attached by machine screws. If removable, different forms of projections can be used with the same mold base 154.

The mold base 154 is intended to accommodate the reenforcing member 132 or 132' which is laid onto the cutaway portion shown on the projection 152 and held in place as the mold is used. Obviously a new channel shaped reenforcing member will be used each time that a load floor is formed since the act of molding locks the reenforcing member 132 or 132' to the load floor. In Figure 15, a reenforcing member of the construction shown in Figure 11 is poised to be mounted on the projection 152. It is dimensioned so that it will not reach the upper surface 158 of the base 154. Its length is such that it will fit between the end protuberances 156 so that when the seat core is molded, there will be nothing to prevent the channel shaped reenforcing member 132' from freely sliding endwise. The protuberance 156 will form the end of the indentation 122 or 122' as deep as the normal indentations and hence leave the space 136 for movement of the reenforcing member 132 or 132'.

The maximum shrinking of the load floor will occur along its length and hence it is best that the reenforcing member be disposed to be able to slide along this dimension. Actually, the utility of the reenforcing member is maximum when disposed lengthwise of the load floor.
The securement or mounting of the reenforcing member 132, 132' or 132" to the mold part before bringing the parts together is capable of being achieved by different means. Self-adhering tape can be used under the members; vacuum openings can be utilized to hold them in place; and a simple magnetic arrangement could be used. In Figure 15, permanent magnets 62 can be mounted along the length of the projection 152 flush with the upper surface to hold the reenforcing member 132 or 132' in place during the molding process.

The reenforcing members 132, 132' and 132" are intended to prevent flexure of the load floor and to strengthen the same. Different arrangements can be used for different purposes.

In Figure 13 there is illustrated a load floor which has two reenforcing members 164 and 166 molded therein to provide great strength and stiffness.

In Figure 14 there is illustrated a load floor in which there are two reenforcing members 168 and 170 arranged end to end but separated in the center. In this case, the only place where flexure can take place is in the center; hence the floor will be permitted to flex but only to a limited extent.

It is pointed out that the addition of metal members to the blow-molded load floor does not add substantially to the cost thereof because once the mold has been constructed, it requires only a few seconds to mount the reenforcing member
into the mold before bringing the parts together in the molding machine. This is not the same effect as fabricating the conventional sheet metal load floor because, when the seat core of the invention is withdrawn from the mold, it is completed but for the attachment of hardware. The reenforcing members can be drilled, tapped or provided with studs and the like (entering suitable sockets formed to clear in the mold base) so that hardware can be attached directly thereto if desired when assembling the same to the vehicle.

In the specification and claims the walls 28 and 30 have been described as parallel. These walls need not be geometrically parallel but could be at a slight angle relative to one another to provide a tapered load floor or the like. Likewise the walls could have different or the same curvatures. Reference to "parallel" is for convenience and not intended as limiting.

Summarizing, the load floor has been described as formed as a blow-molded member out of polyethylene or other of the synthetic polymers conventionally used in blow-molding techniques. It emerges from the mold as a completely finished article but for the need to attach the hinges, brackets and connectors. Inserts may be placed in the mold before each charge carrying nuts or other sockets which are permanently molded into the finished article and will thus receive fastening means when installation occurs.

Fabricated metal load floors are made as a unit from multiple pieces and such unit is not very pleasant in
appearance. Such load floor construction normally is buried in the upholstery of the seat back, those parts which of necessity must protrude being carpeted, painted or otherwise finished.

As one would conclude from the preceding, a load floor constructed in accordance with the invention enables the surface of the article to be molded with any desired texture built into the mold, such as, for example, graining. Further, the plastic used can be of any desired color without difficulty. Thus, it is feasible to construct the seat back so that the floor load is exposed. This provides a hard surface for the floor when used to support goods.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A load floor especially for the core of a fold down vehicle seat or the like automotive structural member comprising a hollow blow-molded member of synthetic resin whose overall thickness is substantially less than its size, including a pair of generally parallel walls having a peripheral connecting wall joining them around the member, a plurality of tying links extending between the parallel walls on the interior of the member and comprising each such link being integral with a first parallel wall and comprising an indented formation having a bottom which is generally parallel with said first parallel wall from which the indented formation extends, the depth of the indented formation being such as to carry the said bottom into engagement with the interior surface of the second and opposite parallel wall and forming a web therewith which is approximately twice the thickness of either of the parallel walls, the indented formation being produced during the blow-molding operation whereby the said bottom and the said portion of the respective parallel walls are permanently welded together, said tying links being distributed generally throughout the member whereby to rigidify and strengthen said member and said member having means to accommodate if not enable securement of automotive hardware.
2. The load floor according to claim 1 and at least one of said indentations extending a substantial distance along the length of said load floor and having a channel shaped reinforcing member of metal locked to the bottom and sides thereof.

3. The load floor according to claim 1 in which said last mentioned indentation has a cross-section comprising a flat bottom and angled outward walls and a sheet metal reinforcing member of generally channel construction conforming to and locked into the bottom of said indentation and somewhat less than coextensive in length therewith.

4. The load floor according to any one of claims 1, 2 or 3 in which said generally parallel walls extend over substantially all of said members, said tying links being distributed throughout the entire area of said member.

5. The load floor according to claims 2 or 3 in which at least the last-mentioned indentation has its bottom engaged with the unindented interior surface of the opposite parallel wall.
6. The load floor according to claim 2 or 3 in which the channel shaped reenforcing member has straight side arms angled outward.

7. The load floor according to claim 2 or 3 in which the channel shaped reenforcing member has straight side arms angled outward and the free edges of the side arms have flanges thereon and the side walls of the said last-mentioned indentation having pockets confining said flanges.

8. The load floor according to claim 2 or 3 in which the length of the last-mentioned indentation is greater than the length of the reenforcing member leaving a free space to permit sliding of the reenforcing member when the load floor cools after molding.

9. The load floor according to claim 3 in which the free edges of the channel arms of the reenforcing member have outwardly extending flanged engaged in pockets formed in the side walls of said one indentation.
10. The load floor according to claim 3 in which the ends of said one indentation are provided with areas to enable sliding of the reenforcing member when the load floor cools after molding.

11. The load floor according to claim 3 in which the depth dimension of the side walls of said one indentation are greater than the equivalent dimension of the channel arms of said reenforcing member whereby to provide blocking formations along the length of said one indentation preventing removal of said reenforcing member.

12. The load floor according to claim 2 or 3 in which the length of the last-mentioned indentation is greater than the length of the reenforcing member leaving a free space to permit sliding of the reenforcing member when the load floor cools after molding, the depth dimension of the side walls of the indentation being greater than the equivalent dimension of the channel arms of the reenforcing member.

13. The load floor according to any one of claims 2, 3, 5 through 12 in which there is a plurality of reenforcing members, each in a separate indentation.
14. The load floor according to any one of claims 2, 3, 5 through 12 in which there is a plurality of reinforcing members arranged end to end in said one indentation.

15. The load floor according to any one of claims 1 to 14 in which said hollow blow-molded member is generally rectangular in configuration.

16. The load floor according to claims 1 to 15 in which the said bottom is engaged with the unindented interior surface of said second and opposite wall.

17. The load floor according to any one of claims 1 to 15 in which said bottom is engaged with the bottom of a second indented formation in said opposite parallel wall and aligned with the first mentioned formation so that the bottoms meet and are welded together during the blow-molding operation.
18. The load floor according to any one of claims 1 to 17 in which substantially of the indented formations extend inwardly from a single one of said parallel walls whereby the other parallel wall presents a substantially unindented surface suitable for use as the top of said load floor.

19. The load floor according to any one of claims 1 to 18 in which the geometric configuration of said indented formations comprise rectangles in cross section.

20. The load floor according to any one of claims 1 to 18 in which the geometric configuration of said indented formations comprise rectangles in cross section, at least some of the indented formations being substantially frusto-pyramidal in configuration.

21. The load floor according to any one of claims 1 to 20 in which at least one of the indented formations is frusto-conical.
22. The load floor according to any one of claims 1 to 20 in which at least one of the indented formations is substantially cylindrical.

23. The load floor according to claims 1 or 2 in which said last mentioned means comprise a depression in a parallel wall of said member formed during blow-molding whereby to bring the bottom of said depression into welded engagement with a portion of the other parallel wall to form a double thickness web thereat.

24. The load floor according to claims 1 or 2 in which said last mentioned means comprise metal insert means permanently anchored in said member in at least one of said parallel walls and presenting socket means for fasteners to the exterior of said one parallel wall.

25. The load floor according to claims 1 or 2 in which said last mentioned means comprise a depression in a parallel wall of said member formed during blow-molding whereby to bring the bottom of said depression into welded engagement with a portion of the other parallel wall to form a double thickness web thereat, said means to enable
accommodation if not securement also comprising metal insert means permanently anchored adjacent said depression in at least one of said parallel walls and presenting socket means for fasteners to the exterior of said one parallel wall.

26. The load floor according to claims 1 or 2 in which said last mentioned means comprise metal insert means permanently anchored in said member in at least one of said parallel walls and presenting socket means for fasteners to the exterior of said one parallel wall and said tying links are located additionally in the immediate vicinity of said metal insert means.

27. The load floor according to claims 1 or 2 in which said means to accommodate comprise a depression in a parallel wall of said member spaced slightly below the surface of said wall and having an offset wall integral with and connected to said last mentioned parallel wall whereby to accommodate a hardware plate member seated therein.
28. The load floor according to claims 1 or 2 in which said means to accommodate comprise a depression in a parallel wall of said member spaced slightly below the surface of said wall and having an offset wall integral with and connected to said last mentioned parallel wall whereby to accommodate a hardware plate member seated therein and tying link means connecting the last mentioned offset wall and the opposite parallel wall to strengthen the offset wall, said tying link means being of substantially the same construction as the said tying link but having an overall length shorter than the distance between the said parallel walls.

29. The load floor according to claims 1 or 2 in which said means to accommodate comprise a depression in a parallel wall of said member spaced slightly below the surface of said wall and having an offset wall integral with and connected to said last mentioned parallel wall whereby to accommodate a hardware plate member seated therein and tying link means connecting the last mentioned offset wall, said tying link means being of substantially the same construction as the said tying link but having an overall length shorter than the distance between the said parallel walls and metal insert means permanently anchored to said offset wall and presenting socket means for fasteners to the exterior of said offset wall and at least some of the tying link means are located adjacent the metal insert means.
30. The load floor according to any one of claims 1 to 29 and, in combination therewith, an automotive vehicle seat back adapted to be moved between at least two positions, one of which is erect for serving as a back rest and the other of which is flat for serving as a load floor, said load floor being incorporated into and connected with said seat back.

31. A method of forming a load floor as a hollow member having a pair of opposite generally parallel walls spaced apart and a narrow peripheral wall joining the opposite wall, indentations in at least one of said parallel walls extending to the opposite wall defining tying links therebetween, said method comprising blow-molding by providing a mold which has one part with projections of the size and configuration to form the indentations of the load floor, the height of the projections being selected each to form an indentation whose bottom welds to the opposite wall to produce a web having a thickness twice that of either parallel wall whereby to form said tying links, bringing the mold parts together upon a parison during the molding process separating the parts subsequent to the molding process and removing the load floor.
32. The method as defined in claim 31 and the incorporation of a metal reinforcing member as a permanent part of the load floor locked into one of the indentations by the additional steps of forming one of said projections of dimension smaller on its end and sides than the other projections by an amount substantially equal to the thickness of the reinforcing member, laying the reinforcing member onto said one projection and fixing same into position, thereafter bringing the mold parts together upon the parison, said reinforcing member being permitted to slide during cooling of the load floor subsequent to the molding process to effect locking of said reinforcing member thereto.

33. A load floor substantially as hereinbefore described with reference to the accompanying drawings.

34. A method of forming a load floor substantially as hereinbefore described with reference to the accompanying drawings.

35. The steps or features disclosed herein or any combination thereof.

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by its Patent Attorneys

DAVIES & COLLISON.