United States Patent [19]

Cook et al.

[11] **3,906,071**

[45] **Sept. 16, 1975**

[54] **DIP MOLDING PROCESS**

[75] Inventors: **William J. Cook,** Rockford; **Gordon A. Ellens,** Grand Rapids, both of Mich.

[73] Assignee: **Leon Chemical & Plastics Div. of U.S. Industries Inc.,** Grand Rapids, Mich.

[22] Filed: **Apr. 30, 1973**

[21] Appl. No.: **355,900**

[52] **U.S. Cl.** **264/255;** 264/297; 264/303; 264/305; 264/306; 425/93

[51] **Int. Cl.**[2] **B29D 9/00**

[58] **Field of Search** .... 117/5.1, 72, 94, 47 H, 117/DIG. 6, 26, 5.3; 264/255, 306, 305, 303, 297; 425/93, 269, 270

[56] **References Cited**

UNITED STATES PATENTS

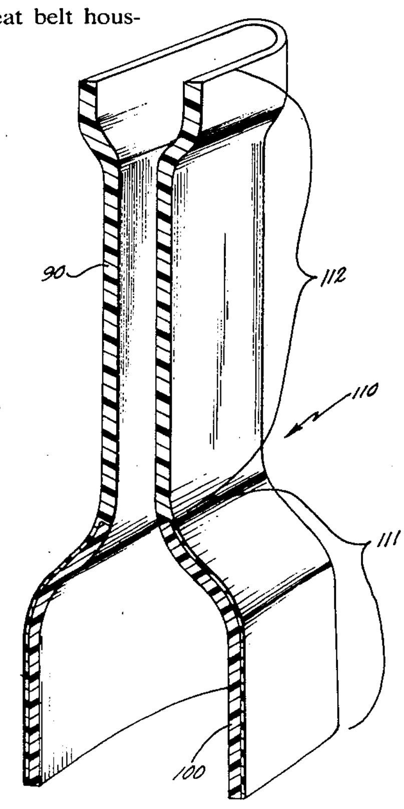
2,617,208	11/1952	Marx et al.	264/305
3,117,341	1/1964	Abildgaard et al.	264/303
3,136,651	6/1964	Spessard	117/21
3,140,195	7/1964	Nagel	117/21
3,268,355	8/1966	Brodeur, Jr.	117/94
3,487,146	12/1969	Tillotson	264/306
3,584,096	6/1971	Kassouni et al.	264/122
3,694,117	9/1972	Gould et al.	425/93

Primary Examiner—William D. Martin
Assistant Examiner—Dennis C. Konopacki
Attorney, Agent, or Firm—Price, Heneveld, Huizenga & Cooper

[57] **ABSTRACT**

A dip molding process for producing seat belt housings or the like in which a portion of a heated mold or die is dipped relatively quickly into a plastisol having a first durometer rating and is then, after a delay to allow the first coat to gel and cool somewhat, subsequently dipped into a second plastisol having a different durometer rating. In the first dip, only a portion of the mold is dipped. In the second dip, the mold is dipped to a depth and for a time sufficient that the rest of the effective mold surface is coated to a desired thickness. The two plastisols are arranged in adjacent tanks and sets of molds are conveyed from a preheating oven to the plastisol tanks and then to subsequent conventional operations. The molds are heated in the preheating oven to a temperature higher than the temperature normally used to dip mold into the second plastisol and to a temperature which is sufficiently high to allow for the heat loss which will be experienced from the time the mold is first dipped into the first plastisol until the time it is first dipped into the second plastisol. The dip tanks can be raised and lowered at different rates to provide a means for adjusting the length of the dip cycle. The dip cycle time for the second plastisol is set to give the desired thickness and to avoid drips, running and air bubbles. The dip cycle time for the first plastisol is set for a relatively quick run to create a delay from the end of the first dip until the initiation of the second dip and to compensate for the higher temperature of the molds and to thereby prevent excessive plastisol buildup on the mold. The resultant seat belt housing has one portion, either the base or the snout, which is more flexible than the other so that the snout will flex more readily with respect to the other.

33 Claims, 6 Drawing Figures



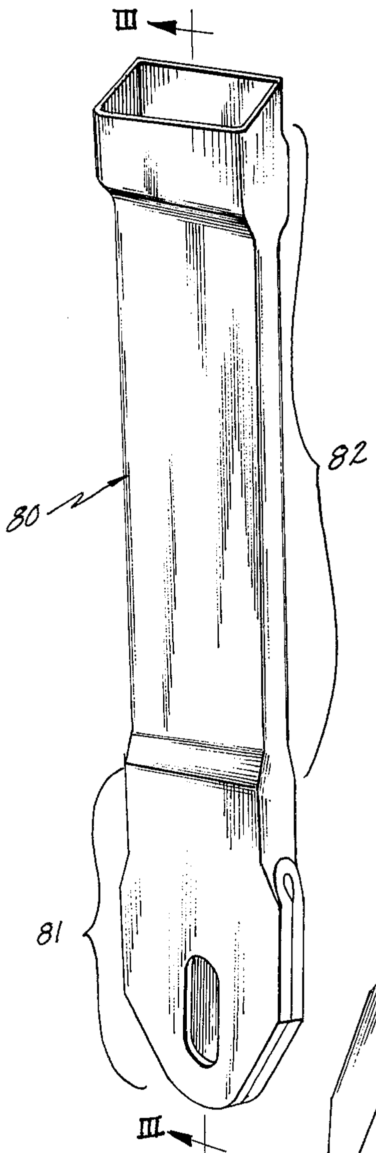


FIG. 1

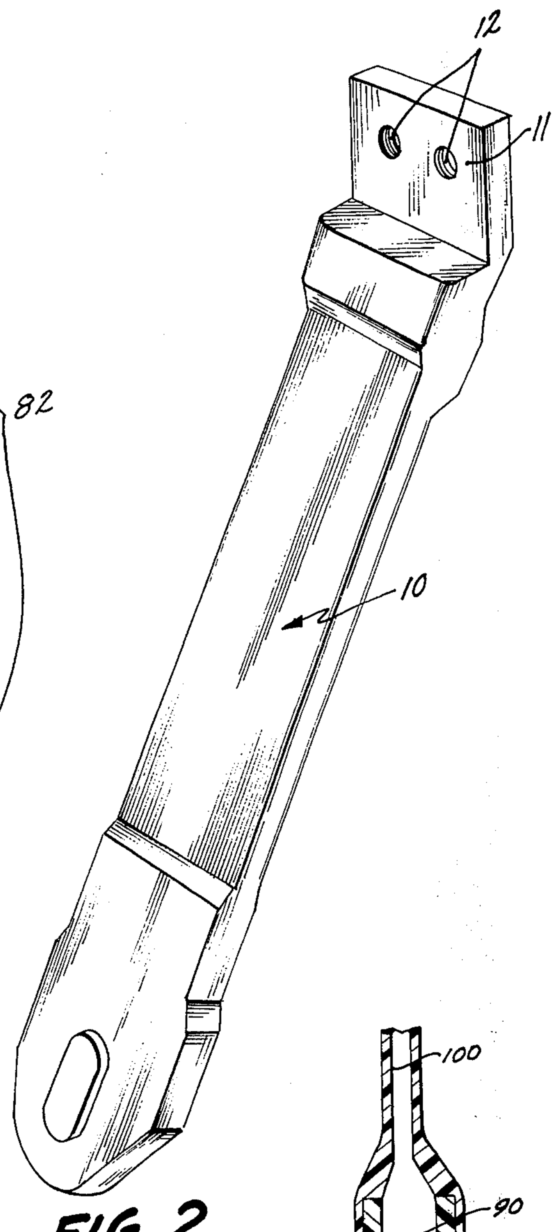


FIG. 2.

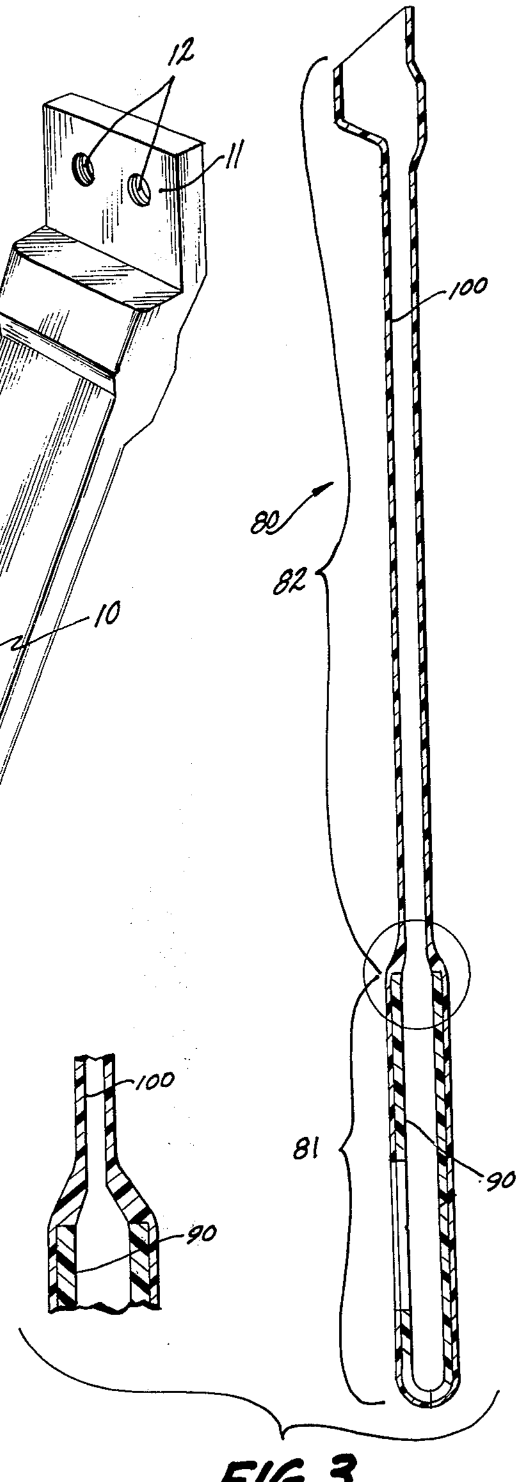


FIG. 3

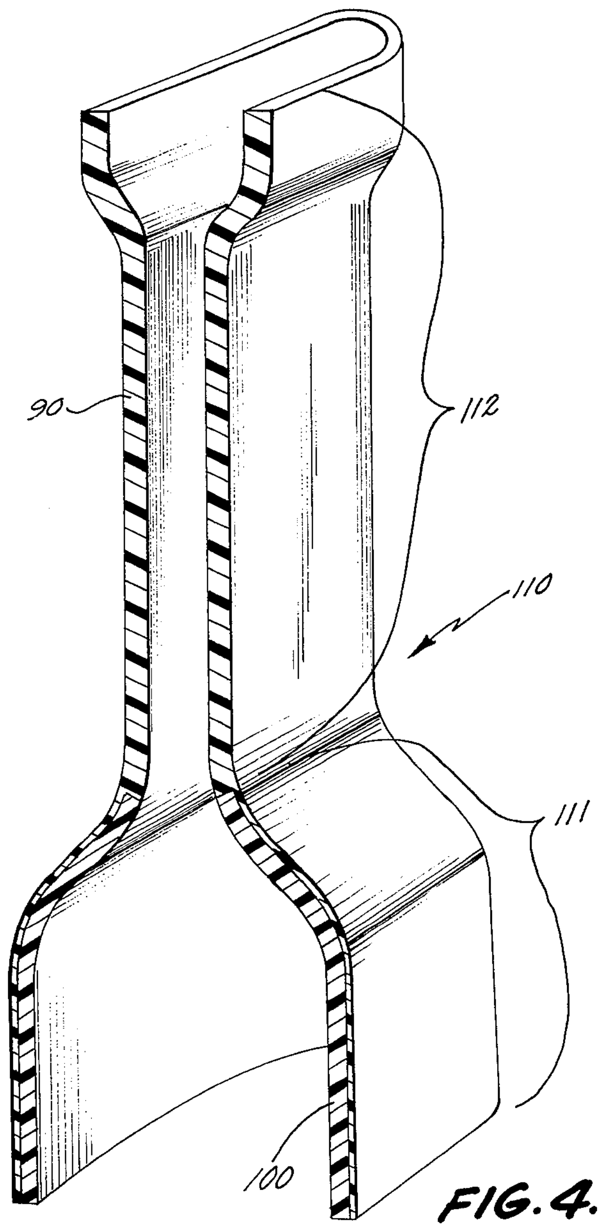


FIG. 4.

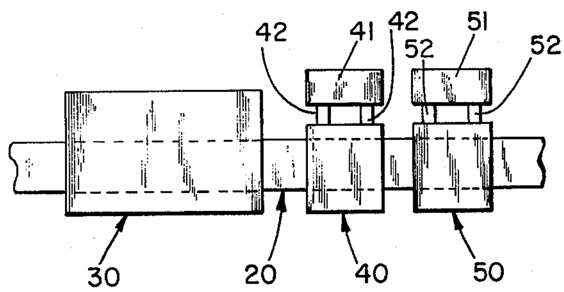


FIG. 5

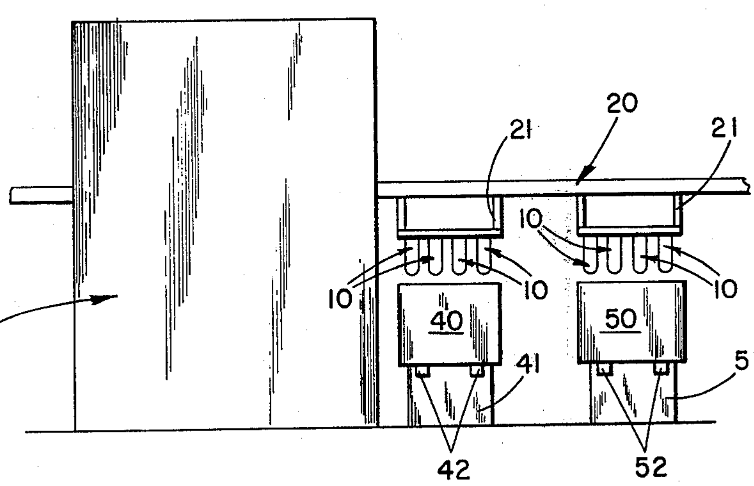


FIG. 6

DIP MOLDING PROCESS

BACKGROUND OF THE INVENTION

This invention relates to dip molding, and particularly to vinyl dip molding. In dip molding, a mold having a desired configuration is heated and then dipped into a dip molding plastisol, typically a vinyl plastisol. The basic dip molding process is well-known to those skilled in the dip molding art.

For some purposes, it is desirable to reinforce a dip-molded article. In a seat belt retractor housing, for example, it is in some applications desirable to provide a rigid base for covering the retractor and a softer, flexible snout for housing the belt portion. Contrawise, it might be desirable to provide a more flexible base to facilitate mounting of the housing and yet have a more rigid snout in order to keep the end of the seat belt located in a generally constant position in the car.

One can obtain the desired flexibility for the flexible portion of the article by using a vinyl plastisol having a lower durometer rating. The more rigid portion of the article can be formed by using a reinforcing insert. Such inserts are inserted into the housing just after it is dip molded. While it might at first blush seem more economical to mold around an insert, one problem encountered in such situations is that it is difficult to interconnect the reinforcing insert to the dip molding mold. Further, the presence of such an insert causes running and dripping since it provides another surface which complicates the flow pattern of the plastisol around the dip-molding mold. Accordingly, the inserts are laboriously inserted into the hot molding just after it is stripped off the mold.

Another type of housing has heretofore been made by dipping a mold first partially into one plastisol of one durometer rating and then immediately, within **5** or **10** seconds, into a second plastisol of a second durometer rating in an attempt to crease a housing having one portion more flexible with respect to the other. The second dip was performed immediately after the first in order to make sure the mold was still hot enough when dipped into the second plastisol to coat. If the mold cools too much, it will not coat.

One problem with the housing made by this method is that the second plastisol coats too heavily over the first plastisol coating, thereby wasting plastisol. Further, where the second plastisol is of a higher durometer rating (yielding a more rigid plastic), the effect of the lower durometer plastic is minimized and the housing does not have the desired degree of flexibility of one portion with respect to the other. Another problem is that the process does not lend itself readily to commercialization. If the length of time of the first dip is set the same as the time for the second dip, the first coating will be unnecessarily thick since the mold is only partially dipped. Yet, if the first dip time is made shorter than the second, one of the dip tanks must be idle while the other is being used. This is so the mold can be kept in the preheating over until just prior to the first dip and then dipped from the first dip to the second without delay. Thus, the problem of making a dip molded article with one portion more flexible than the other has heretofore not been satisfactorily solved.

SUMMARY OF THE INVENTION

The present invention comprises a dip molding process in which a preheated dip molding mold is dipped first into a first source of plastisol having a first durometer rating and is delayed in the atmosphere for a time sufficient to allow the first coating to gel and cool somewhat before the mold is dipped into a second source of plastisol having a second durometer rating. A product is produced having one portion which is relatively flexible and another portion which is relatively rigid. In spite of the delay, the two portions are integrally adhered to one another to form a single integral part. First and second sources of plastisol are maintained at a temperature suitable for dip molding. A dip molding mold is heated to a temperature higher than the temperature normally required to dip mold into the second plastisol. The heated mold is dipped into the first plastisol a distance sufficient to coat only a portion of the mold and for a time sufficient to coat the portion to a desired thickness. Following the aforesaid delay, the mold is dipped into the second plastisol a greater distance for a time sufficient to coat the portion of the mold not already coated to a desired thickness. Subsequently, conventional dip molding operations are performed.

Preferably, molds are mounted in sets on a conveying means. The sets are spaced at center-to-center intervals corresponding to the space between the centers of the adjacent plastisol dip tanks. Means are provided for differentially varying the dip times for the first and second dip tanks so that the first dip is faster than the second. The dip cycle time for the second plastisol is set sufficiently long to facilitate coating of the mold to a desired thickness without any undesirable dripping, running, or bubbling. The dip time for the first plastisol is set for a shorter length of time sufficient only to coat a portion of the mold to a desired thickness. Not only does this provide a time delay following the first dip during which the mold is exposed to the surrounding atmosphere, but also this compensates for the fact that the mold is probably slightly higher in temperature than it normally would be when it is dipped into the first tank. The delay gives the first plastisol coating on the mold on a chance to gel and allows the surface of the first coating to cool before it is dipped into the second tank. Apparently because the plastic is an insulating material, the heat of the mold will not tend to flow to the outer surface of the first plastisol coating. Thus, when the mold is subsequently dipped into the second plastisol, there will be less tendency for the second plastisol to coat over the first plastisol coating. Further, because the first plastisol coating has had a chance to gel somewhat before it has been dipped, it will not tend to simply "mix" with the second plastisol material as it coats onto the mold.

One product which can be manufactured using this process is a seat belt housing of the type shown in either FIG. **3** or FIG. **4.** Both housings are integrally formed of plastic but include a relatively rigid portion and a relatively flexible portion. This makes the snout flex or deflect aside more readily with respect to the base. When a person bumps against the snout, the snout tends to deflect more readily thereby decreasing the chance of scraping or bruising a person. Yet, no reinforcements are required to achieve this result.

These and other objects, aspects, and features of the present invention will be more fully understood and appreciated by reference to the written specification and appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a seat belt housing made in accordance with the present invention;

FIG. 2 is a perspective view of a dip molding mold used to produce the housing of FIG. 1;

FIG. 3 is a cross-sectional view taken along plane III—III of FIG. 1 with a portion (encircled) of the bottom of the housing exploded away and enlarged;

FIG. 4 is a perspective and cross-sectional view of an alternative embodiment housing made in accordance with the present invention;

FIG. 5 is a plan, schematic view of the apparatus employed in the dip molding process of the present invention; and

FIG. 6 is a front elevational schematic view of the apparatus employed in the dip molding process of the present invention.

PREFERRED EMBODIMENT

In the preferred embodiment, sets of dip molding molds, such as mold **10** (FIG. **2**), are carried by a conveyor **20** (FIGS. **5** and **6**) through a preheating over **30** to a first dip tank **40**, a second dip tank **50**, and to other stations where conventional dip molding process steps are performed (FIGS. **5** and **6**). Dip tank **40** contains vinyl plastisol of a durometer rating of approximately **70** on the Shore A scale and dip tank **50** contains a similar vinyl plastisol of a durometer rating of approximately **95** on the Shore A scale. The molds **10** are heated in oven **30** to a temperature higher than that normally required to dip into the plastisol in the second dip tank **50** and to a temperature which is sufficiently high to compensate for the heat loss which will be experienced from the time the molds are first dipped into dip tank **40** until the time they are first dipped into dip tank **50.** The heated molds are dipped a portion of the way into the first tank and then, after a delay which allows the first plastisol to gel and to cool somewhat, are dipped generally all of the way into the second dip tank **50.** They are then conveyed to other conventional dip molding work stations and the finished housings (FIGS. **1** and **3**) are stripped off of the molds at a suitable work station located along the length of conveyor **20.** The housing **80** has a lower portion or base **81** formed primarily of a layer of vinyl plastic **90** having a durometer rating of approximately **70** on the Shore A scale (FIG. **3**). The upper portion or snout **82** of housing **80** is formed of a vinyl **100** having a hardness of approximately **95** on the Shore A scale. Only a slight thickness of the higher durometer plastic **100** forms over the lower durometer plastic **90** at the lower portion **81** of housing **80.**

As a result, the housing **80** is more flexible at its lower portion **81** than would be the case if the entire housing were made only out of the higher durometer plastic **100.** Accordingly, the housing **80** is easier to work with during installation. It is easier to spread the flaps at the lower portion **81** apart to fit them over the seat belt mounting hardware. Similarly, the flexibility in the lower portion **81** makes it possible to more easily deflect the upper portion or snout **82** to the left or to the right than would be the case if the entire housing **80** were made out of the higher durometer plastic **100.** Yet, the snout **82** is more rigid than the lower portion **81** thereby more positively locating the end of the seat belt with respect to the user. The more rigid **95**-durometer vinyl **100** provides this desired rigidity without the need for any reinforcing inserts.

In order to attain this product, a plurality of molds **10** are mounted to spaced racks **21** which are carried on conveyor **20** (FIG. **6**). Each mold **10** includes a mounting portion or mounting flange **11** which is not intended to to coated. Rather, mounting flange **11** is provided solely to facilitate mounting to a carriage **21.** Bolt holes **12** are provided through flange **11** to facilitate the bolting of mold **10** to carriage **21.**

The carriages **21** are mounted on conveyor **20** at spaced intervals such that the distance between the centers of the carriage **21** corresponds to the distance between the centers of the adjacent dip molding tanks **40** and **50.** This arrangement makes it possible to be dipping different sets of molds **10** into the different dip tanks **40** and **50** simultaneously.

The molds **10** mounted on carriages **21** are conveyed through a preheating over **30.** Such ovens are well-known in the art. The dip molding molds must be preheated before the vinyl plastisol will coat on them. As is well-known in the art, many factors are considered before selecting a specific mold temperature for a particular plastisol.

In the present invention, the molds **10** are heated to a temperature which is higher than the temperature normally required for dipping in the plastisol which is in the second dip tank **50.** Further, the molds **10** are heated to a temperature which is sufficiently high to compensate for the heat which will inevitably be lost from the time the molds are first dipped into the first dip tank **40** until the time they are dipped into the second dip tank **50.** There is approximately a **30°** drop in temperature from the time mold **10** is first dipped into dip tank **40** until it is dipped into dip tank **50.** This may vary from **15°** to **45°** F. under different circumstances. Because of the **30°** heat loss, the molds **10** are preferably heated to a temperature ranging to as high as **15°** to **45°** F. higher than one would normally heat the mold for dipping into dip tank **50.** Typically, it will be about **30°** F. higher. By the time they reach dip tank **50,** they still have sufficient heat to effect suitable coating with the **95** durometer plastisol that is in dip tank **50.**

On the other hand, as will be appreciated by those skilled in the art, the molds **10** will be at an abnormally high temperature for dipping into the **70** durometer plastisol composition which is in dip tank **40.** As a result, the dip cycle used for dipping the molds **10** into dip tank **40** is relatively shorter than it would normally be. A rapid dip cycle makes up for the fact that the molds are carrying excess heat at this point. While one would normally dip more slowly in order to avoid running, this is not as great a problem on the first dip into dip tank **40** since minor imperfections created in the first dip will pretty generally be covered during the more deliberate second dip into dip tank **50.**

The dip tanks **40** and **50** are mounted on elevators **41** and **51** respectively (FIGS. **5** and **6**). Each of the elevators includes supports **42** and **52** respectively, extending laterally therefrom for supporting dip tank **40** or dip tank **50** respectively. The elevators **41** and **51** are provided with conventional controls for controlling the dip cycle. The cycle **10** are dipped by actually raising the dip tank **40** or **50** until the molds **10** are positioned within the plastisol. Conventional means are provided for raising and lowering the different tanks at different rates. This makes it possible to use a rapid dip cycle for tank 40 and a more deliberate dip time for tank 50.

When the molds 10 are dipped into dip tank 40, they are dipped only so that the lower portion thereof is covered by the lower durometer plastisol which is located in dip tank 40. As a result, only the lower portion 81 of seat belt housing 80 is made of the more flexible 70-durometer vinyl plastic 90 (FIG. 3). As noted above, the dip cycle time for the molds 10 into dip tank 40 is fairly rapid in order to make up for the fact that the mold temperature is abnormally high for dipping into the 70-durometer plastisol. If one proceeded too slowly, one would get an excessive buildup of the 70-durometer plastisol on the lower portion of mold 10. The exact time for this first dip cycle will vary depending on conventional considerations. Once the conventional time is determined, however, the actual time used in this case should be shortened by about 10 to 30 seconds.

Further, the dip cycle time for the first dip in the dip tank 40 is shorter than the cycle time for the dip in the dip tank 50 is intended to create a delay which gives the first plastisol and opportunity to gel on the surface of mold 10. As a result, the first coating has integrity and continuity when it is dipped into the second plastisol in dip tank 50. If the mold is dipped quickly into the second dip tank 50, the first coating would be too fluid at the time of the second dip into dip tank 50 and there would be more of a tendency for the first plastisol to intermix with the second plastisol thereby defeating the purpose of the first dip. Secondly, the delay which exists from the time the molds 10 leave the first dip tank 40 until they enter the second dip tank 50 enables the surface of the first plastisol coating to cool off somewhat. Because the first plastisol coating is an insulator, the heat of the mold tends to be held in by the first partial coating, and it is also prevented from being conducted to the outer surface of the plastisol coating as a result of the insulating effect. Accordingly, this cooler surface of the first coating tends to pick up less of a coating of the second plastisol in the second dip tank 50. Thus, it is preferable that there in fact be a delay between the time the molds 10 leave dip tank 40 until they enter dip tank 50, thereby exposing them to the cooler atmosphere surrounding the work area. The initiation of the dipping of adjacent sets of molds into the adjacent tanks 40 and 50 is done generally simultaneously. But the dip cycle time for the first tank 40 is shorter, thereby yielding the aforesaid desired delay.

The dip into the 95-durometer plastisol in dip tank 50 is more deliberate, and is governed by conventional considerations well-known to those skilled in the dip molding art. The relative time for the first and second dips should be optimumly adjusted so that there is approximately about a 30 to 90 second delay, preferably about a 1-minute delay from the time the molds 10 leave the plastisol in dip tank 40 until they are actually dipped into the plastisol in dip tank 50. The 1-minute delay is sufficient to allow the first plastisol coating to gel somewhat and to allow the surface of the first coating to cool somewhat prior to the dip into dip tank 50. Further, the heat loss experienced in mold 10 during this 1-minute interval is only approximately 30° F. The partial covering of the mold 10 with the first plastisol coating tends to insulate mold 10 and minimize the heat loss from the mold which is experienced. The range of time for effecting a delay sufficient to allow gelling and cooling, yet short enough to keep the heat loss from mold 10 within desirable limits is from about 30 seconds to about 90 seconds.

After the molds 10 have been dipped into the first dip tank 40 and been delayed slightly in the atmosphere, they are ready for dipping into dip tank 50. Conveyor 20 moves them into position over dip tank 50, and elevator 51 elevates dip tank 50 so the plastisol flows around the partially coated molds 10. The second plastisol only coats the first plastisol to a slight degree as is indicated by the cross-sectional view, FIG. 3. That portion of vinyl 100 which covers vinyl 90 is relatively thin compared to the overall thickness of vinyl 100 in the upper or snout portion 82 of housing 80. The reason for this only slight coating is that the first coating 90 has been allowed to cool and first coating 90 tends to insulate and prevent the heat of the mold from migrating to the surface of the coating, thereby minimizing plastisol pickup. In the case of housing 80, this slight coating of higher durometer plastisol 100 does tend to make the bottom portion 81 more rigid than would be the case if only 70-durometer plastisol 90 were located at the base portion 81. And, it does create a harder outer surface than would otherwise be the case. However, the bottom portion 81 is still more flexible than would be the case if the 95-durometer plastic 100 were the only coating at the bottom 81.

After the second dip, the molds 10 are conveyed through subsequent conventional dip molding steps until the finished housings are finally stripped off of mold 10.

Dip molding compositions are well-known in the art. Typically, polyvinyl chloride resins are compounded with various plasticizers to create a desired plastisol. The pthalate plasticizers are one example of plasticizers which can be used. These and other vinyl resins and plasticizers for dip molding are readily available from any of a number of producers and suppliers.

While it is not absolutely necessary to use one specific type of vinyl plastisol, it is believed that superior results are achieved in the present method by using plastisols of the type described and claimed in U.S. Pat. No. 3,584,096, issuing on June 8, 1971, to Sarkis M. Kassouni and Arthur S. Nicholas and assigned to Vinyl Industrial Products, Inc., the disclosure of which is specifically incorporated herein by reference. Such plastisols fuse to form a suede-like finish. They are formulated by mixing a resin having an average particle size of less than 500 microns with the same or a similar resin having larger particle sizes. The relationship of the smaller particle sizes to the larger particle sizes is in the range of from about 1 to 6.5 to 1 to 200. A suitable plasticizer is then added to form the plastisol. Such plastisols have a suede-like, nonreflective finish as they gel up on the heated mold. Even before being passed through the fusing oven, these plastisols coat to a roughened surface finish. It is believed that the roughened surface of the initial coating helps to yield a better adhesion between the second plastisol layer and the first plastisol layer thereby minimizing any tendency of the second layer to peel away from the first layer after final curing and fusing A vinyl plastisol having a 95-durometer rating on the Shore A scale can be obtained from Vinyl Industrial Products under the basic code designation of "95DLD 10-101A." A vinyl plastisol having a 70-durometer rating on the Shore A scale can be obtained from Vinyl Industrial Products under the basic code designation of "70DLR 10-097B." These plastisols are available in various colors. References to the durometer ratings for plastisols or for the fused plastic will be understood throughout, including in the claims, to refer to the durometer reading which the fused plastic has on the Shore A scale.

The housing **80** discussed above is manufactured in accordance with this process by placing a lower durometer rating vinyl plastisol in dip tank **40** and a higher durometer rating plastisol in dip tank **50**. In this way, housing **80** is produced with a more flexible base portion **81** and a more rigid snout **82**. However, the process can be used in reverse, i.e., with a higher durometer rating plastisol in dip tank **40** and a lower durometer rating plastisol in dip tank **50**. Housing **110** of FIG. **4** is made in this way. As a result, housing **110** has a very rigid lower portion **111** and a more flexible upper snout **112**. This can be seen by reference to the cross-sectional portion of FIG. **4**. The lower portion **111** of the housing consists primarily of a **95**-durometer vinyl plastic **100**. Snout **112** is made of a more flexible **70**-durometer vinyl plastic **90**, with some of the more flexible vinyl **90** forming a thin coating over vinyl **100** in the base area **111**. As a result, one has a housing **110** formed integrally in one piece of plastic which has a rigid base portion **111** for providing a rigid cover over a seat belt retractor and a flexible snout portion **112** to serve as a guide and carrier for the seat belt. Snout **112** should be made of a material sufficiently rigid that it acts to locate the end of the seat belt generally adjacent the user. Yet, snout **112** is sufficiently flexible that if one accidentally bumps against it with their leg, for example, it merely deflects aside without injuring the person.

As a result of the precess of this invention, a product can be made, as for example the seat belt housings **80** and **110**, which has a more rigid portion and a more flexible portion. Yet, the product can be made integrally in one piece of plastic. The need for separate reinforcing members is eliminated. One can diminish the possibility of scarring or bruising a person by utilizing either housing **80** or **110**. In the case of housing **80**, the base is slightly more flexible so that if one brushes against the snout **82**, it bends at base **81** more readily. In the case of housing **110**, the base **111** is more rigid, but the snout **112** is sufficiently flexible that if one brushes against it, it tends to bend aside, rather than injure.

Of course, it will be understood that the above is merely a preferred embodiment of the invention and that other dip molded products can be made by the invention and that various changes and alterations can be made without departing from the spirit and broader aspects of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A dip molding process comprising: providing a first source of a first dip molding plastisol having a first durometer rating and a second source of a second dip molding plastisol having a second durometer rating; heating a dip molding mold to a temperature higher than the temperature normally required to dip mold in the second plastisol; dipping said mold into said first plastisol a distance sufficient to coat only a portion of the mold surface and for a time sufficient to coat said portion to the desired thickness; subsequently dipping the partially coated mold into the second plastisol a distance greater than said portion and for a time sufficient to coat the first coated portion and the portions of said mold not already coated to a desired thickness; delaying the initiation of said subsequent dip into said second plastisol for a period of time of approximately **30** to **90** seconds after said mold leaves said first plastisol and maintaining said mold in an atmosphere cooler than the temperature of said mold during said delaying step to allow the first coating of plastisol on said mold to gel somewhat and allowing the surface of said coating to cool somewhat prior to initiation of said subsequent dip; and subsequently removing the resulting molded article from said mold.

2. The dip molding process of claim **1** comprising: heating said mold to a temperature approximately **15°** to **45°** F. higher than the temperature normally required to dip into

3. The dip molding process of claim **3** comprising: dipping said mold into said second plastisol in approximately **1** minute of the time said mold leaves said first plastisol.

4. The dip molding process of claim **2** which comprises: dipping said mold into said first plastisol approximately **10** to **30** seconds less than one would normally dip into said first plastisol.

5. The dip molding process of claim **2** comprising: dipping said mold into said second plastisol sufficiently soon after it leaves said first plastisol that the temperature of said mold drops only approximately **30°** F. from the time at which it is first dipped into said first plastisol and the time that it is first dipped into said second plastisol.

6. The dip molding process of claim **5** in which said first plastisol has a durometer rating of no greater than approximately **95** on the Shore A scale and said second plastisol has a different durometer rating of no less than approximately **70** on the Shore A scale.

7. The dip molding process of claim **5** in which said first plastisol has a durometer rating of no less then approximately **70** on the Shore A scale and said second plastisol has a different durometer rating of no greater than approximately **95** on the Shore A scale.

8. The dip molding process of claim **1** in which said mold is heated to a temperature sufficiently high to allow for the heat loss which will be experienced from the time said mold is first dipped into said first plastisol until the time said mold is first dipped into said second plastisol.

9. The process of claim **1** comprising: providing at least said first plastisol of a composition which gels to a roughened surface shortly after dipping is completed.

10. The process of claim **1** comprising: providing said first plastisol of a mixture of first resin particles having an average particle size of less than **500** microns, a similar resin having particles whose size with relationship to said first resin particles is in the range of approximately **6.5** to **1** to **200** to **1**, and a suitable plasticizer.

11. The process of claim **1** comprising: providing first and second plastisols of a mixture of first resin particles having an average particle size of less than **500** microns, a similar resin having particles whose size with relationship to said first resin particles is in the range of approximately **6.5** to **1** to **200** to **1**, and a suitable plasticizer.

12. A dip molding process comprising: providing a first source of a first dip molding plastisol having a first durometer rating and a second source of a second dip molding plastisol having a second durometer rating; positioning said first and second sources adjacent one another; providing conveying means for conveying molds to and from said first and second sources; positioning a plurality of sets of molds, each set having at least one mold therein, on said conveying means at spaced intervals, each interval from center to center being approximately the same as the spacing between the centers of said frst and second sources; providing means for differentially varying the dip times for said first and second sources; setting the dip time for said second source for a length of time sufficient to coat a mold to the desired thickness without any undersirable dripping, running, or bubbling; setting the dip time of said first source for a shorter length of time then the dip time of said second source, sufficient only to coat a portion of the mold to a desired thickness and sufficiently short to create a delay from the time a set of molds leaves said first source until it enters said second source; conveying said sets of molds through an oven at a temperature and for a time sufficient to preheat said molds to a temperature higher than the temperature normally required to dip mold in said second plastisol and sufficiently high to allow for the heat loss which will be experienced from the time a mold is first dipped into said first source until it is first dipped into said second source whereby when a mold is finally dipped into said second source, it will have sufficient heat to acquire an adequate plastic coating; conveying said sets of molds to said first and second sources; generally simultaneously initiating the dipping of adjacent sets of molds in said first and second sources and sequentially dipping each set of molds first into said first source and then into said second source whereby a portion of each mold will be first coated with said first plastisol in said first source while the coated portion and uncoated portion of said mold will be coated in said second source; and subsequently removing the resulting molded article from said mold.

13. The process of claim **12** in which said mold is maintained in an atmosphere cooler than the temperature of said mold during the delay between the end of the dip into the first plastisol until the initiation of the dip into the second plastisol, whereby the surface of the first coating of plastisol on said mold has an opportunity to cool somewhat prior to initiation of said subsequent dip.

14. The dip molding process of claim **12** comprising: heating said mold to a temperature approximately **15**° to **45**° F. higher than the temperature normally required to dip into the second plastisol.

15. The dip molding process of claim **14** comprising dipping said mold into said second plastisol approximately **30** to **90** seconds after said mold leaves said first plastisol.

16. The dip molding process of claim **14** comprising: dipping said mold into said second plastisol in approximately one minute of the time said mold leaves said first plastisol.

17. The dip molding process of claim **14** which comprises: dipping said mold into said first plastisol approximately **10** to **30** seconds less than one would normally dip into said first plastisol.

18. The dip molding process of claim **14** comprising: dipping said mold into said second plastisol sufficiently soon after it leaves said first plastisol that the temperature of said mold drops only approximately **30**° F. from the time at which it is first dipped into said first plastisol and the time that it is first dipped into said second plastisol.

19. The dip molding process of claim **18** in which said first plastisol has a different durometer rating of no greater the approximately **95** on the Shore A scale and said second plastisol has a durometer rating of no less than approximately **70** on the Shore A scale.

20. The dip molding process of claim **18** in which said first plastisol has a durometer rating of no less than approximately **70** on the Shore A scale and said second plastisol has a different rating of no greater than approximately **95** on the Shore A scale.

21. The process of claim **12** comprising: providing at least said first plastisol of a composition which gels to a roughened surface shortly after dipping is completed.

22. The process of claim **12** comprising: providing said first plastisol of a mixture of first resin particles having an average particle size of less than **500** microns, a similar resin having particles whose size with relationship to said first resin particles is in the range of approximately **6.5** to **1** to **200** to **1**, and a suitable plasticizer.

23. The process of claim **22** in which said second plastisol is the same as said first plastisol.

24. A dip molding process comprising: providing a first source of a first dip molding plastisol having a durometer rating of no less than approximately **70** on the Shore A scale; providing a second source of a second dip molding plastisol having a different durometer rating of no greater than approximately **95** on the Shore A scale; preheating a dip molding to a temperature higher than the temperature normally required to dip mold in the second plastisol and sufficiently high to allow for the heat loss which will be experienced from the time a mold is first dipped into said first source until the time at which it is subsequently dipped into said second source whereby when a mold is finally dipped into said second source, it will have sufficient heat to acquire a satisfactory plastic coating; dipping a portion of said mold into said first plastisol at a dip rate substantially faster than one would normally dip into said first plastisol; subsequently dipping said mold into the second plastisol a distance greater then said portion for a time sufficient to coat the coated portion and non-coated portions of said mold to a desired thickness; delaying the initiation of said subsequent dip into said second plastisol for a period of time following said first dip into said first plastisol sufficient to allow the first coating of plastisol on said mold to gel somewhat and allowing the surface of said first coating to cool somewhat prior to initiation of said subsequent dip; and subsequently removing the resulting molded article from said mold.

25. The dip molding process of claim **24** comprising: heating said mold to a temperature approximately **15**° to **45**° F. higher than the temperature normally required to dip into the second plastisol.

26. The dip molding process of claim **25** comprising dipping said mold into said second plastisol approximately **30** to **90** seconds after said mold leaves said first plastisol.

27. The dip molding process of claim **25** comprising: dipping said mold into said second plastisol in approximately one minute of the time said mold leaves said first plastisol.

28. The process of claim **27** in which said mold is maintained in an atmosphere cooler than the temperature of said mold during said delaying step whereby the surface of the first coating of plastisol on said mold has an opportunity to cool somewhat prior to initiation of said subsequent dip.

29. The dip molding process of claim **28** comprising: dipping said mold onto said second plastisol sufficiently soon after it leaves said first plastisol that the temperature of said mold drops only approximately **30°** F. from the time at which it is first dipped into said first plastisol and the time that it is first dipped into said second plastisol.

30. The process of claim **24** comprising maintaining said mold in an atmosphere cooler than the temperature of said mold following completion of the first dip into said first plastisol during said delaying step.

31. The process of claim **24** comprising: providing at least said first plastisol of a composition which gels to a roughened surface shortly after dipping is completed.

32. The process of claim **24** comprising: providing at least said first plastisol of a mixture of first resin particles having an average particle size of less than **500** microns, a similar resin having particles whose size with relationship to said first resin particles is in the range of approximately **6.5** to **1** to **200** to **1**, and a suitable plasticizer.

33. The process of claim **32** in which said second plastisol is the same as said first plastisol.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,906,071

DATED : September 16, 1975

INVENTOR(S) : William J. Cook et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 2, line 42:

After "mold" omit --- on ---.

Col. 8, line 18, claim 2:

After "into" add --- the second plastisol. ---.

Col. 10, line 13, claim 20:

After "different" insert --- durometer ---.

Col. 10, line 33, claim 24:

After "dip molding" insert --- mold ---.

Signed and Sealed this

sixteenth Day of *March 1976*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks