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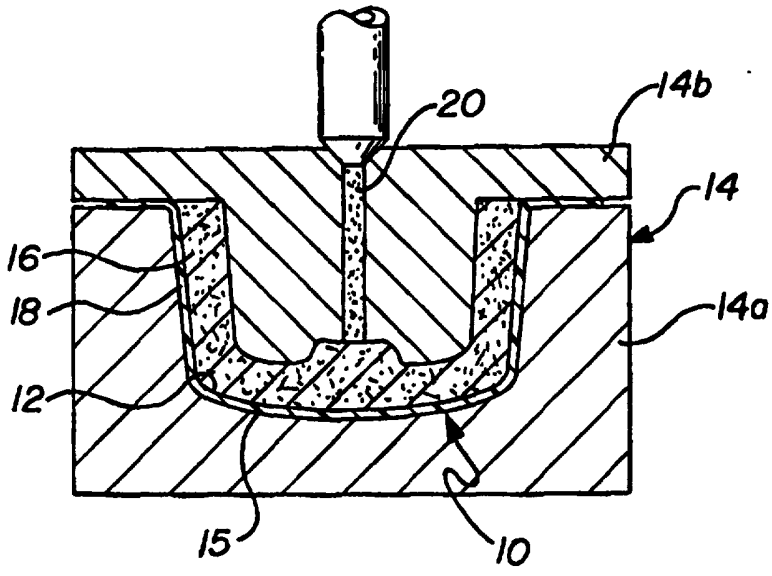
(54) Title: METHOD FOR FABRICATING PAINTED BUMPER

(57) Abstract

A method of making a painted article (10) includes use of a fiber preform (16) and paint film (18). The preform (16) is formed to the desired shape, and the paint film (18) is heat deformed to a complimenting shape. The paint film (18) is placed in a mold (14) and the preform (16) is placed thereover. The mold (14) is closed and resin metered therein. The cured article (10) is removed with a reinforced substrate and painted film surface thereover.



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METHOD FOR FABRICATING PAINTED BUMPER

TECHNICAL FIELD

The invention relates to articles molded with reinforcement material, such as automotive bumpers, and more particularly toward reinforced resin molded articles with a painted surface formed thereon.

BACKGROUND OF THE INVENTION

Current automotive bumper systems have consisted of metal or plastic substrates, energy absorbers and external surface facie. U.S. Patent No. 3,493,257 issued February 3, 1970 discloses a resilient microcellular foam bumper. The patent discloses the use of a sprayed paint pigment layer in a mold used in resin molding of a bumper. United States Patent No. 4,762,352 issued August 9, 1988 and United States Patent No. 5,290,079 issued March 1, 1994 disclose fiber reinforced resin bumper beams. United States Patent No. 4,545,105 issued October 8, 1985 discloses a stretched material metal film on underlying bumper formation wherein the stretching step occurs without vacuum application.

United States Patent No. 5,009,821 discloses a method in which a surface film is formed into the mold cavity surface simultaneously with resin

impregnation of a fiber preform. Surface films are listed, though none are comprised of a paint film. The patent also discloses resin transfer molding (RTM) and reinforced reaction injection molding (RRIM or SRIM). These processes use a fiber reinforced mat or preform placed in a mold cavity into which reactive polymeric precursor materials are subsequently injected. The polymeric precursor materials react to form a molded plastic article having fiber reinforcement throughout. Other U.S. patents relating to general molding processes are cited in the patent.

SUMMARY OF THE INVENTION

The invention provides a method of making a painted, formed article for use in a vehicle. The method includes the steps of forming a preform of reinforcement material, placing a paint film and the preform in a mold, molding the preform with the paint film forming the article by injecting plastic material into the mold, and curing and removing the article from the mold.

The invention also includes a painted formed article for use on a vehicle. The article comprises a preform of predefined contour including reinforcement material, a paint film formed of the predetermined contour complementary with the preform and resinous molding material molded within the preform securing the

paint film to the preform molding the article.

BRIEF DESCRIPTION OF THE DRAWINGS

Advantages of the invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Figure 1 is a partially cut away perspective view of an article comprising a composite bumper;

Figure 2 illustrates the process of a first embodiment showing the step of forming a preform by a vacuum process;

Figure 3 diagrammatically illustrates the step of vacuum forming the paint sheet to a mold and placing the preform thereover;

Figure 4 illustrates the step of injecting resinous material into the mold; and

Figure 5 illustrates the second embodiment of the step of forming the paint film against the preform.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A fiber-reinforced molded plastic article 10 is generally shown in Figure 1. Such an article 10 is suitable for installation on an automotive vehicle as in a bumper assembly. It will be readily appreciated that the fiber-reinforced plastic article 10 made by the process discussed herein may likewise be of a different shape for other automotive body panels or parts, as well as various types of fiber-reinforced molded plastic articles.

As illustrated in Figures 3-4, the article 10 is produced by resin transfer molding (RTM) or structural reaction injection molding (SRIM) processes wherein plastic or resin, namely polymeric precursor materials, is metered or injected into a mold cavity 12 of a mold 14. Such general molding process is known in the art by including the mold cavity 12 supporting and containing a preform 16 of reinforcement fiber material. In general, the resinous material 20 is injected or provided into the mold cavity 12 to impregnate the fiber preform 16 to form the article 10.

The subject invention improves this process by use of a paint film 18. The paint film 18 is molded to the desired shape, placed in the mold 14 with the preform 16 so that during resin molding the paint film 18 will be molded with and adhered to the external

surface of the preform 16 to form the article 10.

The preform 16 is formed of reinforcement material, such as fiberglass 22, which is held in place by an applied binder 23, as commonly known in the art. Such preform may be manufactured as disclosed in U.S. Patent No. 5,009,821 set forth in the Background of the Invention. The preform 16 is formed on a shaped perforated screen 26 of the desired contour, and a vacuum 28 is applied to draw the fibers 22 against the screen 26. The fibers 22 may include binder 23 thereon so that when the screen 26 is heated, the binder 23 melts to bind the fibers to one another. Alternatively, the binder 23 may be subsequently sprayed over the vacuum formed fibers 22 to retain the shape of the preform 16, as illustrated in Figure 2.

There are two embodiments of the process for making the article 10 according to the general teachings hereinabove. In the first embodiment of forming the article 10, the preform 16 is utilized. The mold 14 includes a lower mold half 14a providing a contoured surface 15 complementing the contour of the preform 16. The paint film 18 is placed in the lower mold 14 and vacuum-formed thereagainst by a vacuum 30, as illustrated in Figure 3. It is also possible to vacuum-form the paint film 18 in a separate mold or the same mold 14. The paint film 18 is heated and vacuum-formed to mold or deform to the contour of the mold 14

and therefore preform 16 at opposed surfaces 16a, 16b as shown in Figure 3. Heating of the paint film 18 may be by steam or conductive heating of the mold 14. With the paint film 18 formed and placed in the lower mold 14, the preform 16 is placed thereover and the upper mold half 14b is closed to enclose the mold cavity 12. Thereafter, resin material 22 such as polymeric precursor material, is provided into the mold cavity 12 to impregnate the preform 16 and contact the paint film 18. The article 10 is cured within the mold 14 and then removed therefrom to provide an article 10 with the paint film 18 on an exterior surface.

In the second embodiment of the method, the paint film 18 is vacuum-formed against the preform 16 while on the screen 26 as illustrated in Figure 5. A heated paint film 18 is placed over the preform and the vacuum draws the paint film 18 against the preform 16 molding it to the predetermined shape. Thereafter, the combination preform 16 and paint film 18 may be placed in the mold 14 for the injection of resin material 20 therein.

The molding with the resin material 20 may be with RTM or SRIM, as previously discussed. The reinforcement material 22 may be comprised of fiberglass or other reinforced fibers. The paint film is commonly available, such as from 3M and Avery Dennis.

WHAT IS CLAIMED IS:

1. A method of making a painted, formed article for use in a vehicle, the method including the steps of:

forming a preform of reinforcement material;

placing a paint film and the preform in a mold so that the paint film engages the preform along opposed suraces thereon;

injecting polymeric precursor material behind the fiber preform such that the polymeric precursor material impregnates the fiber preform and contacts the paint film at the opposed surfaces; and

curing and removing the article from the mold.

2. The method as set forth in claim 1 further including vacuum forming the paint film prior to the molding step.

3. The method as set forth in claim 2 wherein the vacuum forming includes vacuum forming the paint film in the mold prior to placing the preform in the mold.

4. The method as set forth in claim 2 wherein the vacuum forming includes vacuum forming the paint film against the preform prior to placing in the mold.

5. The method as set forth in claim 2 including drawing reinforcement fibers against a screen form with binder to form the preform.

6. The method as set forth in claim 2 wherein the molding includes metering resin into the mold through the preform.

7. The method as set forth in claim 3 further including the forming of the preform with fiberglass.

8. The painted, formed article for use on a vehicle, the article comprising:

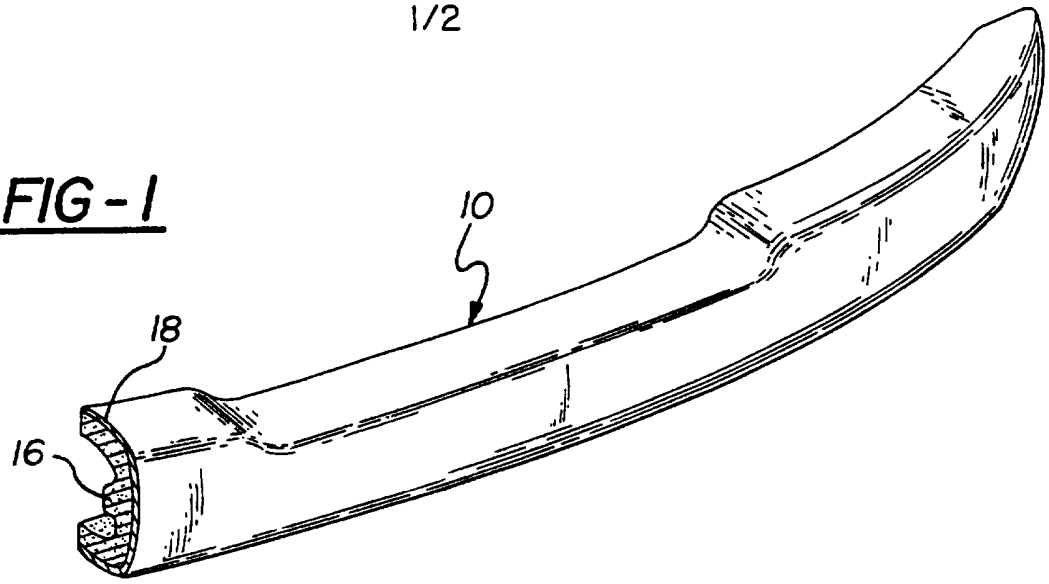
a preform of a predefined contour including reinforcement material;

a paint film formed of said predetermined contour complimentary with said preform;

resinous molding material molded within said preform; and

securing said paint film to said preform molding to the article.

FIG - 1



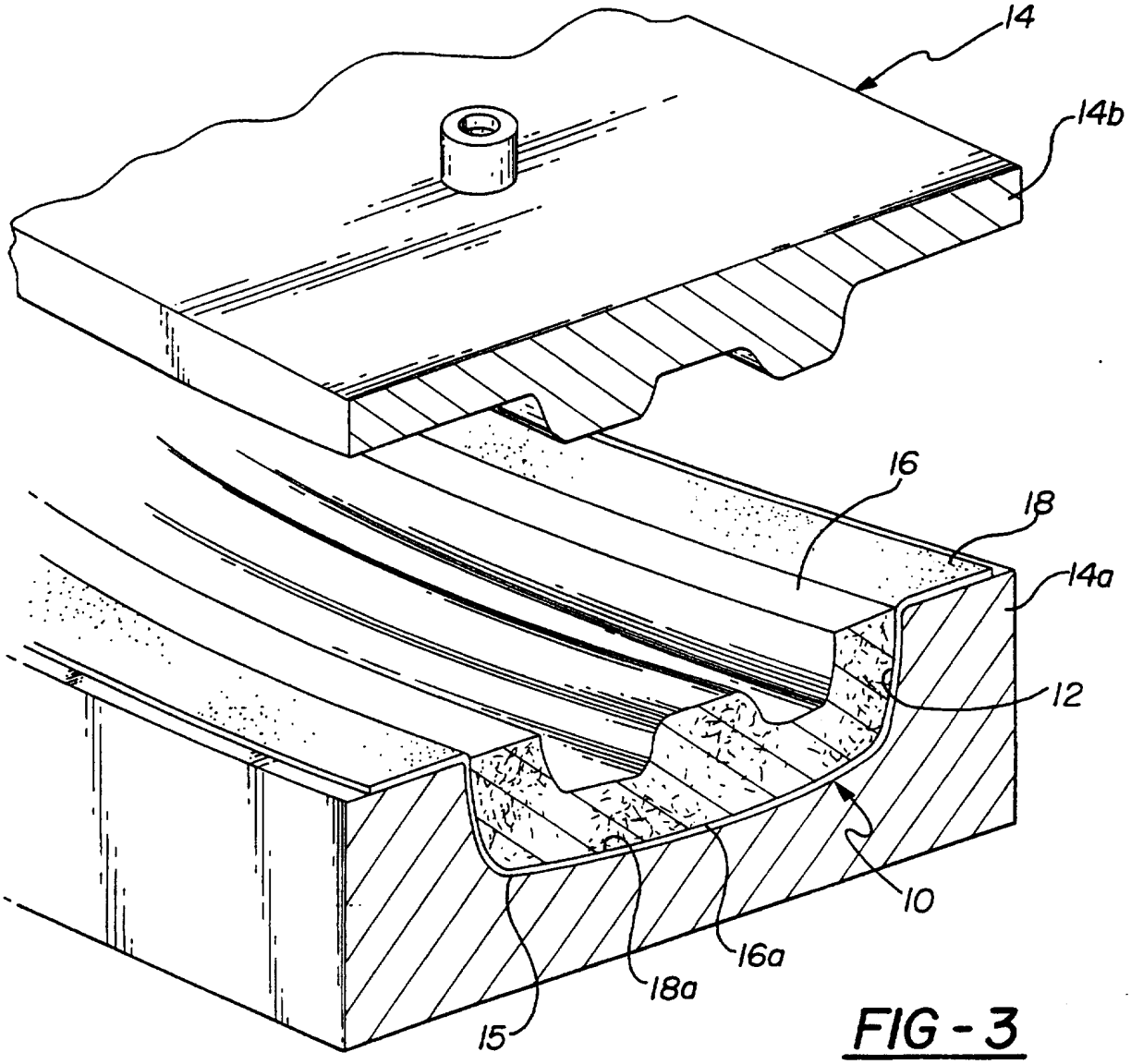


FIG - 3

FIG-2

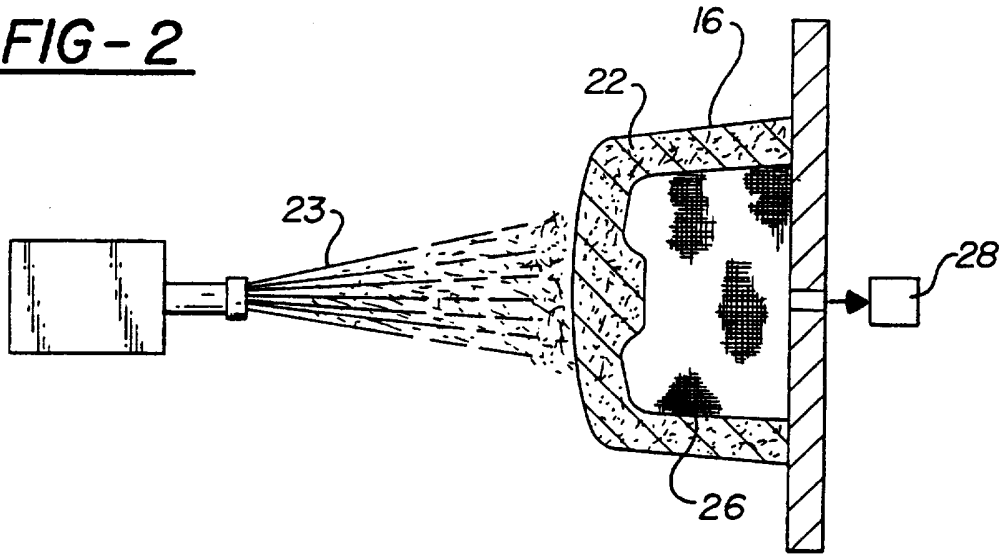


FIG-4

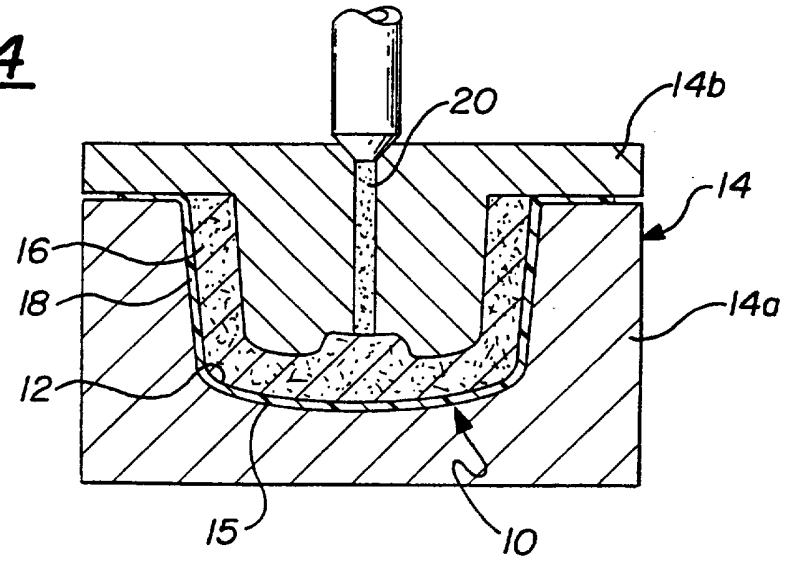
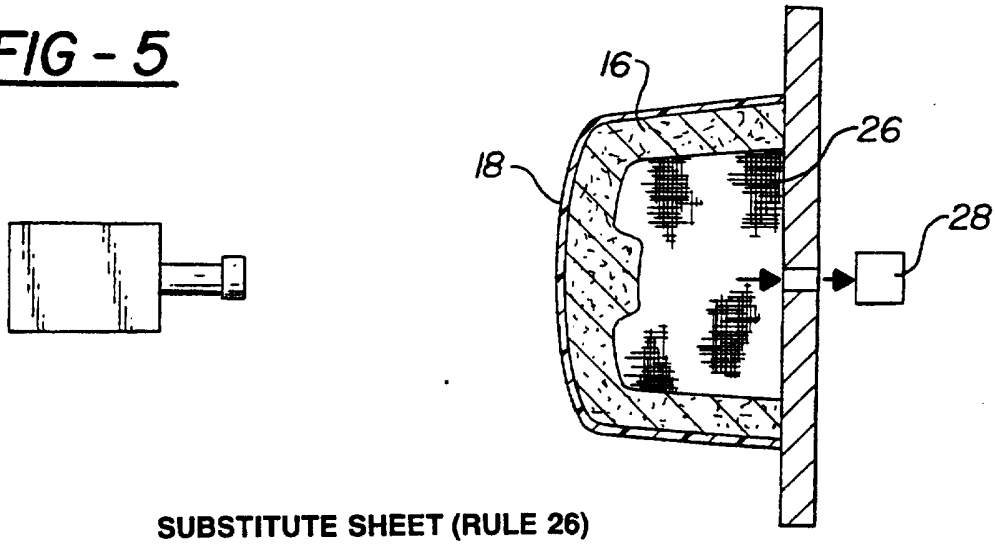


FIG-5



INTERNATIONAL SEARCH REPORT

In. .national application No.
PCT/US97/03824

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :Please See Extra Sheet.
US CL :Please See Extra Sheet.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 264/132, 257, 259, 266, 510, 511, 513;
428/420

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, 3,493,257, A (FITZGERALD ET AL) 03 February 1970 (03.02.70), ENTIRE DOCUMENT.	1-8
Y	US, 4,545,105, A (KOWALSKY) 08 October 1985 (08.10.85), ENTIRE DOCUMENT.	1-8
Y	US, 4,762,352, A (ENOMOTO) 09 August 1988 (09.08.88), ENTIRE DOCUMENT.	1-8
Y	US, 4,952,358, A (OKINA ET AL) 28 August 1990 (28.08.90), ENTIRE DOCUMENT.	1-8
Y	US, 4,965,037, A (WEAVER ET AL) 23 October 1990 (23.10.90), ENTIRE DOCUMENT.	1-8
Y	US, 5,000,903, A (MATZINGER ET AL) 19 March 1991 (19.03.91), ENTIRE DOCUMENT.	1-8

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/03824

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, 5,009,821, A (WEAVER) 23 April 1991 (23.04.91), ENTIRE DOCUMENT.	1-8
Y	US, 5,041,260, A (JOHNSON ET AL) 20 August 1991 (20.08.91), ENTIRE DOCUMENT.	1-8
Y	US, 5,064,707, A (WEAVER ET AL) 12 November 1991 (12.11.91), ENTIRE DOCUMENT.	1-8
Y	US, 5,068,076, A (WEAVER ET AL) 26 November 1991 (26.11.91), ENTIRE DOCUMENT.	1-8
Y	US, 5,290,079, A (SYAMAL) 01 March 1994 (01.03.94), ENTIRE DOCUMENT.	1-8
Y	US, 5,328,494, A (KELMAN ET AL) 12 July 1994 (12.07.94), ENTIRE DOCUMENT.	1-8
Y	US, 5,401,457, A (VALYI) 28 March 1995 (28.03.95), ENTIRE DOCUMENT.	1-8
Y	US, 5,407,631, A (SALISBURY) 18 APRIL 1995 (18.04.95), ENTIRE DOCUMENT.	1-8
Y	EP, 0 247 359, A2 (OKINA ET AL) 02 December 1987 (02.12.87), ENTIRE DOCUMENT.	1-8
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Y	JP 54-127472 A (SAMBO JUSHI KOGYO K) 03 October 1979 (03.10.79), ENTIRE DOCUMENT.	1-8
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A. CLASSIFICATION OF SUBJECT MATTER:
IPC (6):

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B32B 9/00

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US CL :

264/132, 257, 259, 266, 510, 510, 513;
428/420