A method of manufacturing a vehicle frame assembly including an integrated hitch having a coating thereon includes the initial step of providing a vehicle frame assembly including an integrated hitch. A coating of a first material is provided on the integrated hitch. The coating of the first material provided on the integrated hitch is dehydrated, and a coating of a second material is provided over the coating of the first material provided on the integrated hitch. Lastly, the coating of the first material and the coating of the second material provided on the integrated hitch are cured.
PROVIDE FRAME ASSEMBLY WITH INTEGRATED HITCH

COAT FRAME ASSEMBLY AND INTEGRATED HITCH WITH FIRST MATERIAL

DEHYDRATE FIRST MATERIAL

COAT INTEGRATED HITCH WITH SECOND MATERIAL

CURE COATINGS OF THE FIRST AND SECOND MATERIAL

FIG. 1

FIG. 2
(PRIOR ART)
METHOD OF MANUFACTURING A VEHICLE FRAME ASSEMBLY INCLUDING AN INTEGRATED HITCH HAVING A COATING

BACKGROUND OF THE INVENTION

[0001] This invention relates in general to methods for manufacturing vehicle frame assemblies. In particular, this invention relates to an improved method of manufacturing a vehicle frame assembly that includes an integrated hitch having a coating of a material provided thereon.

[0002] Many land vehicles in common use, such as automobiles, vans, and trucks, include a frame assembly that is supported upon a plurality of ground-engaging wheels by a resilient suspension system. The structures of most vehicle frame assemblies can be divided into two general categories, namely, separate and unitized. In a typical separate frame assembly, the structural components of the body portion and the frame portion of the vehicle are separate and independent from one another. When assembled, the frame portion of the assembly is resiliently supported upon the vehicle wheels by the suspension system and serves as a platform upon which the body portion of the assembly and other components of the vehicle can be mounted. Separate frame assemblies of this general type are found in most older vehicles, but remain in common use today for many relatively large or specialized use modern vehicles, such as large vans, sport utility vehicles, and trucks. In a typical unitized frame assembly, the structural components of the body portion and the frame portion are combined into an integral unit that is resiliently supported upon the vehicle wheels by the suspension system. Unitized frame assemblies of this general type are found in many relatively small modern vehicles, such as automobiles and minivans.

[0003] In vehicles having these or other types of frame assemblies, it is often desirable to provide a hitch on the vehicle frame assembly to facilitate the towing of a trailer or other accessory by the vehicle. Because such trailers and other accessories are typically relatively heavy, it is usually desirable that the hitch be directly supported on the vehicle frame assembly so that the loads generated during such towing are directly transferred thereto. In the past, the hitch was usually provided as an aftermarket device that was mechanically connected to a portion of the vehicle frame assembly after the frame assembly and the remainder of the vehicle were fully manufactured. More recently, however, the hitch has been formed as integral structural component of the vehicle frame assembly at the time of manufacture thereof. In either instance, a portion of the hitch that is engaged by the trailer or other accessory usually extends a short distance beyond the rear end of the vehicle frame assembly and the remainder of the vehicle. This allows that portion of the hitch to be conveniently located to facilitate the connection of the trailer or other accessory thereto, while still providing a direct connection (and, therefore, a direct transfer of the towing load) to the vehicle frame assembly.

[0004] The structural components of the vehicle frame assembly are typically formed from metallic materials (such as steel, for example) that are naturally susceptible to corrosion. Furthermore, during operation of the vehicle, such structural components of the vehicle frame assembly are frequently exposed to environmental conditions that promote the occurrence and accelerate the rate of corrosion, including moisture (from rain, snow, and humidity), heat, and corrosive chemicals (such as salt used for melting snow and ice). Obvi-ously, the corrosion of any portion of the vehicle frame assembly is undesirable. Accordingly, in order to resist the occurrence and rate of corrosion, it is known to apply a coating of a corrosion-resistant material to some or all of the surfaces of the structural components of the vehicle frame assembly during manufacture. This corrosion-resistant coating covers the surfaces of the structural components of the vehicle frame assembly so as to shield them from some of the adverse environmental conditions mentioned above, thereby resisting the corrosion process.

[0005] When the vehicle frame assembly includes an integrated hitch (i.e., a hitch that has been formed as integral structural component of the vehicle frame assembly at the time of manufacture thereof, as discussed above), the hitch would normally be coated with the corrosion-resistant material along with the other structural components of the vehicle frame assembly. However, as mentioned above, a portion of the integrated hitch extends a short distance beyond the rear end of the vehicle frame assembly and the remainder of the vehicle. As a result, that portion of the integrated hitch is exposed to sunlight. It has been found that the coating of the corrosion-resistant material provided on the exposed portion of the integrated hitch can develop an undesirable white or chalky appearance as a result of sustained exposure to the ultraviolet radiation contained in the sunlight. Because this exposed portion of the integrated hitch is normally disposed in plain view, it is desirable that the exposed portion of the integrated hitch have an aesthetically pleasing appearance.

[0006] The occurrence of this white or chalky appearance could be avoided by preventing the exposed portion of the integrated hitch from being coated with the corrosion-resistant material when the remainder of the vehicle frame assembly is coated with the corrosion-resistant material, such as by masking. However, as a practical matter, this masking or other non-coating process has been found to be quite difficult to accomplish. It is also known that the occurrence of this white or chalky appearance could be minimized or prevented by coating the exposed portion of the integrated hitch with a second material that blocks some or all of the ultraviolet radiation contained in the sunlight from passing therethrough to the coating of the corrosion-resistant material. However, known manufacturing methods for applying this second coating on the exposed portion of the integrated hitch have been found to be relatively time-consuming and expensive. Thus, it would be desirable to provide an improved method of manufacturing a vehicle frame assembly including an integrated hitch having a coating of a material provided thereon that is quicker and less expensive to perform.

SUMMARY OF THE INVENTION

[0007] This invention relates to an improved method of manufacturing a vehicle frame assembly including an integrated hitch having a coating of a material provided thereon, that is relatively quick and inexpensive to perform. Initially, a vehicle frame assembly including an integrated hitch is provided. A coating of a first material is provided on the integrated hitch. The coating of the first material provided on the integrated hitch is dehydrated, and a coating of a second material is provided over the coating of the first material provided on the integrated hitch. Lastly, the coatings of the first and second material provided on the integrated hitch are cured.

[0008] Various aspects of this invention will become apparent to those skilled in the art from the following detailed
description of the preferred embodiment, when read in light of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a flow chart of a method of manufacturing a vehicle frame assembly including an integrated hitch having a coating of a material provided thereon in accordance with this invention.

[0010] FIG. 2 is a flow chart of a prior art method of manufacturing a vehicle frame assembly including an integrated hitch having a coating of a material provided thereon.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0011] Referring now to the drawings, there is illustrated in FIG. 1 a flow chart of a method, indicated generally at 10, of manufacturing a vehicle frame assembly including an integrated hitch having a coating of a material provided thereon in accordance with this invention. Although this invention will be described and illustrated in the context of a vehicle frame assembly including an integrated hitch, it will be appreciated this invention may be practiced in any desired environment in the manner described below.

[0012] In a first step 11 of the method 10 of this invention, a vehicle frame assembly including an integrated hitch is provided. This can be accomplished in any desired manner. Typically, a plurality of structural components is initially provided, and at least one of such structural components is or includes a hitch. These structural components can be formed from a single material or from a plurality of materials as desired. Typically, the structural components are formed from one or more metallic materials such as steel, although such is not required. The structural components, including the integrated hitch, are assembled and secured together using any desired process or combination of processes (such as welding, mechanical fasteners, and the like) to form the completed vehicle frame assembly. The completed vehicle frame assembly may be a separate frame assembly as described above, a unitized frame assembly as described above, or any other type of vehicle frame assembly.

[0013] In a second step 12 of the method 10 of this invention, some or all of the structural components of the vehicle frame assembly (including the integrated hitch) are provided with a coating of a first material. The first coating material may be embodied as any material that is desired to be applied to the integrated hitch and any other desired portions of the vehicle frame assembly. For example, the first coating material may be a corrosion-resistant material that is adapted to protect the integrated hitch and the other structural components of the vehicle frame assembly that are exposed to the elements and other relatively harsh environments, as mentioned above. However, the first coating material may be embodied as any other material that is desired to be applied to the integrated hitch and any other desired portions of the vehicle frame assembly.

[0014] The coating of the first material can be provided on the integrated hitch and the other structural components of the vehicle frame assembly using any desired process. For example, the integrated hitch and the other structural components of the vehicle frame assembly can be provided with the coating of the first material using a conventional electrocoating process. To do this, the integrated hitch and other structural components of the vehicle frame assembly are initially immersed in a tank containing a quantity of the first coating material in fluid form. While the vehicle frame assembly is immersed in the tank, an electrical current is passed through the first coating material and the vehicle frame assembly. The passage of the electrical current causes the first coating material to bond to the metallic structural components of the vehicle frame assembly, including the integrated hitch. Thereafter, the vehicle frame assembly is removed from the tank and passed through at least one or more (typically two) post rinse tanks. These post rinse tanks are conventional in the art and are provided to remove excess amounts of the corrosion-resistant coating material from the integrated hitch and the other structural components of the vehicle frame assembly. However, the integrated hitch and other structural components of the vehicle frame assembly can be provided with the coating of the first material using any other desired process.

[0015] In a third step 13 of the method 10 of this invention, the uncured coating of the first material that was provided on the integrated hitch and the other structural components of the vehicle frame assembly is dehydrated. This dehydration step 13 is performed to remove some or all of the water from the uncured coating of the first material provided on the integrated hitch and the other structural components of the vehicle frame assembly. This dehydration process can be performed in any desired manner. For example, the dehydration of the uncured coating of the first material can be performed by the application of a high-velocity stream of clean warm or hot air to the coated portion or portions of the integrated hitch and the other structural components of the vehicle frame assembly. The temperature of this stream of warm or hot air can range, for example, from about 120°F (49°C) to about 140°F (60°C), for example, although any temperature can be used. Alternatively, the dehydration of the coating of the first material can be performed using radiant heaters, such as conventional infrared heaters.

[0016] In a fourth step 14 of the method 10 of this invention, a coating of a second material is provided over the portion of the coating of the first material that was applied to the exposed portion of the integrated hitch. If desired, the coating of the second material can also be provided over any other desired portions of the coating of the first material that was applied to the integrated hitch and other structural components of the vehicle frame assembly. The second coating material may be embodied as any material that is desired to be applied over the coating of the first material. Preferably, the second coating material is a material that is capable of protectively covering the coating of the first material provided on the exposed portion of the integrated hitch and the other structural components of the vehicle frame assembly. For example, the second coating material may be embodied as a conventional material that blocks some or all of the ultraviolet radiation contained in the sunlight that would otherwise pass through to the first coating of the corrosion-resistant material. As a result, the second coating material minimizes the undesirable effects of the ultraviolet radiation contained in the sunlight on the first coating material, as described above. Alternatively, the second coating material may be embodied as a hardened or hardenable material that is adapted to resist chipping of the first coating of the corrosion-resistant material that could result from impacts from small objects, such as stones. However, the second coating material may be embodied as any material that is desired to be applied over the
coating of the first material provided on the integrated hitch and on any other desired portions of the vehicle frame assembly.

[0017] The coating of the second material can be provided over the coating of the first material provided on the integrated hitch and on any other desired portions of the vehicle frame assembly using any desired process. For example, the coating of the second material can be applied in the form of a powder that is sprayed or otherwise applied by means of a conventional robot onto the integrated hitch and onto any other desired portions of the vehicle frame assembly. However, the coating of the second material can be applied in any other desired form and can be applied using any other desired process.

[0018] In a fifth step 15 of the method 10 of this invention, the coating of the first material provided on the vehicle frame assembly and the coating of the second material provided on the integrated hitch and on any other desired portions of the vehicle frame assembly are cured. This curing of the coatings of the first and second materials can be accomplished in any desired manner. For example, this curing can be performed by disposing the entire vehicle frame assembly in an oven and heating it (along with the coatings of the first and second materials) to a predetermined temperature for a predetermined period of time. When so cured, the corrosion-resistant coating material provide a hardened, protective coating for the structural components of the vehicle frame assembly.

[0019] FIG. 2 is a flow chart of a prior art method, indicated generally at 20, of manufacturing a vehicle frame assembly including an integrated hitch having a coating of a material provided thereon. In a first step 21 of the prior art method 20, a hitch sub-assembly is initially provided. The hitch sub-assembly includes either one structural component or a relatively small number of such structural components of the vehicle frame assembly that are initially assembled and secured together with the hitch. The materials used to form the hitch sub-assembly, as well as the manner of its assembly, can be generally the same as described above in connection with the first step 11 of the method 10 of this invention.

[0020] In a second step 22 of the prior art method 20, portions of the hitch sub-assembly are provided with a coating of a first material. The first coating material can be the same corrosion-resistant material described above in connection with the second step 12 of the method 10 of this invention, and the first coating material can be applied to the hitch sub-assembly using the same electro-coating process described above. However, in this second step 22 of the prior art method 20, certain portions of the hitch sub-assembly are prevented from having the first coating material applied thereto. This can be accomplished by masking those portions of the hitch sub-assembly prior to the application of the first coating material. These uncoated portions of the hitch sub-assembly will, as described further below, be used to connect the hitch sub-assembly to the remaining structural components to form the vehicle frame assembly.

[0021] In a third step 23 of the prior art method 20, the first coating material that was applied to the portions of the hitch sub-assembly are cured. This curing of the first coating material can be performed by disposing the hitch sub-assembly in an oven and heating it to a predetermined temperature for a predetermined period of time, as described above in connection with the fifth step 15 of the method 10 of this invention.

[0022] In a fourth step 24 of the prior art method 20, the exposed portion of the hitch provided on the hitch sub-assembly is provided with a coating of a second material. The second coating material can be the same ultraviolet light blocking material described above in connection with the fourth step 14 of the method 10 of this invention, and the second coating material can be applied to the exposed portion of the hitch provided on the hitch sub-assembly using the same powder coating process described above.

[0023] In a fifth step 25 of the prior art method 20, the second coating material that was applied to the exposed portion of the hitch provided on the hitch sub-assembly is cured. This curing of the second coating material can be performed by disposing the hitch sub-assembly in an oven and heating it to a predetermined temperature for a predetermined period of time, as described above in connection with the fifth step 15 of the method 10 of this invention.

[0024] In a sixth step 26 of the prior art method 20, the hitch sub-assembly is secured to the remaining structural components to form the vehicle frame assembly. This can be accomplished by connecting the remaining structural components to those portions of the hitch sub-assembly that were not provided with the first coating material. The materials used to form the remaining structural components, as well as the manner of their assembly with the hitch sub-assembly, can be the same as described above in connection with the first step 11 of the method 10 of this invention.

[0025] In a seventh step 27 of the prior art method 20, the entire vehicle frame assembly (including the previously coated hitch sub-assembly) is provided with a coating of the first corrosion-resistant material. The first coating material can be applied to the vehicle frame assembly using the same electro-coating process described above. However, because the hitch sub-assembly was previously coated and cured as described above, this second application of the first corrosion-resistant material does not adhere to the previously coated portions of the hitch sub-assembly. Rather, the second application of the first corrosion-resistant material adheres only to the uncoated portions of the remaining structural components that were secured to the hitch sub-assembly to form the vehicle frame assembly.

[0026] In an eighth and final step 28 of the prior art method 20, the first coating material that was applied to the remaining structural components of the vehicle frame assembly are cured. This curing of the first coating material can be performed by disposing the entire vehicle frame assembly in an oven and heating it to a predetermined temperature for a predetermined period of time, as described above in connection with the fifth step 15 of the method 10 of this invention.

[0027] The principle and mode of operation of this invention have been explained and illustrated in its preferred embodiment. However, it must be understood that this invention may be practiced otherwise than as specifically explained and illustrated without departing from its spirit or scope.

What is claimed is:
1. A method of manufacturing a vehicle frame assembly including an integrated hitch having a coating of a material provided thereon comprising the steps of:
   (a) providing a vehicle frame assembly including an integrated hitch;
   (b) providing a coating of a first material on the integrated hitch;
   (c) dehydrating the coating of the first material provided on the integrated hitch;
(d) providing a coating of a second material over the coating of the first material provided on the integrated hitch; and
(e) curing the coating of the first material and the coating of the second material provided on the integrated hitch.

2. The method defined in claim 1 wherein step (b) is performed by providing the coating of the first material on the vehicle frame assembly including the integrated hitch.

3. The method defined in claim 1 wherein step (b) is performed by providing a coating of a corrosion-resistant material on the integrated hitch.

4. The method defined in claim 1 wherein step (b) is performed by providing the coating of the first material on the vehicle frame assembly including the integrated hitch, and wherein step (c) is performed by dehydrating the coating of the first material provided only on the integrated hitch.

5. The method defined in claim 1 wherein step (c) is performed by the application of a high-velocity stream of air to the integrated hitch.

6. The method defined in claim 1 wherein step (c) is performed by a radiant heater.

7. The method defined in claim 6 wherein step (c) is performed by an infrared heater.

8. The method defined in claim 1 wherein step (b) is performed by providing the coating of the first material on the vehicle frame assembly including the integrated hitch, step (c) is performed by dehydrating the coating of the first material provided only on the integrated hitch, and step (d) is performed by providing the coating of the second material over the coating of the first material provided only on the integrated hitch.

9. The method defined in claim 1 wherein step (d) is performed by a coating of a material that blocks ultraviolet radiation.

10. The method defined in claim 1 wherein step (e) is performed by disposing the vehicle frame assembly in an oven and heating it to a predetermined temperature for a predetermined period of time.

11. A method of manufacturing an assembly including a portion comprising the steps of:
(a) providing an assembly including a portion;
(b) providing a coating of a first material on the portion of the assembly;
(c) dehydrating the coating of the first material provided on the portion of the assembly;
(d) providing a coating of a second material over the coating of the first material provided on the portion of the assembly; and
(e) curing the coating of the first material and the coating of the second material provided on the portion of the assembly.

12. The method defined in claim 11 wherein step (b) is performed by providing the coating of the first material on the assembly including the portion of the assembly.

13. The method defined in claim 11 wherein step (b) is performed by providing a coating of a corrosion-resistant material on the portion of the assembly.

14. The method defined in claim 11 wherein step (b) is performed by providing the coating of the first material on the assembly including the portion of the assembly, and wherein step (c) is performed by dehydrating the coating of the first material provided only on the portion of the assembly.

15. The method defined in claim 11 wherein step (c) is performed by the application of a high-velocity stream of air to the portion of the assembly.

16. The method defined in claim 11 wherein step (c) is performed by a radiant heater.

17. The method defined in claim 16 wherein step (c) is performed by an infrared heater.

18. The method defined in claim 11 wherein step (b) is performed by providing the coating of the first material on the assembly including the portion of the assembly, step (c) is performed by dehydrating the coating of the first material provided only on the portion of the assembly, and step (d) is performed by providing the coating of the second material over the coating of the first material provided only on the portion of the assembly.

19. The method defined in claim 11 wherein step (d) is performed by a coating of a material that blocks ultraviolet radiation.

20. The method defined in claim 11 wherein step (e) is performed by disposing the assembly in an oven and heating it to a predetermined temperature for a predetermined period of time.

* * * * *