

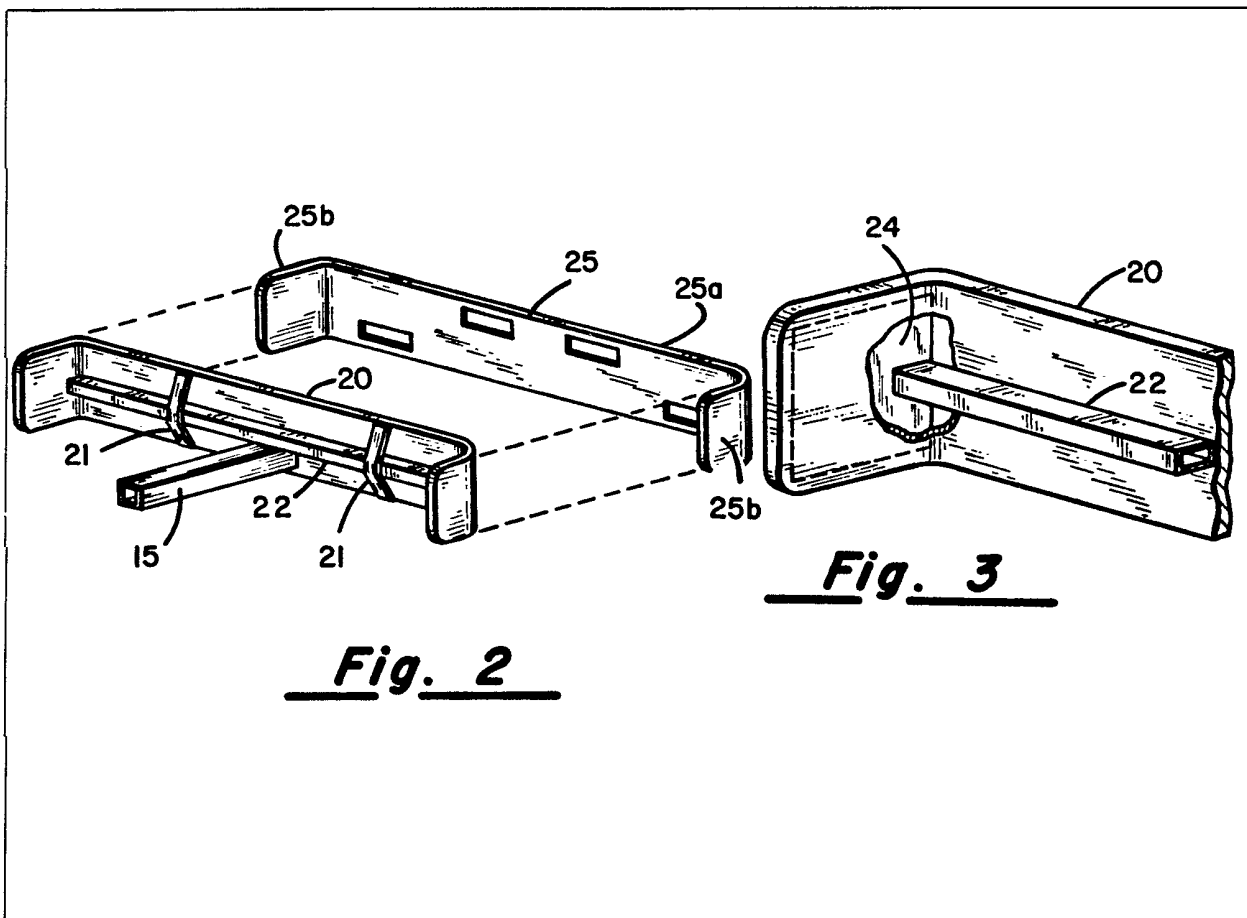
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(54) **Electrostatic paint spraying workpiece support**

(57) A support (20) for holding an irregular shaped electrically non-conductive workpiece (25) for electrostatic paint spraying, comprises: an electrically non-conductive surface conforming to the shape of the workpiece and having one side arranged for nesting against the workpiece; an electrically conductive frame (22) affixed to the non-conductive surface on an

opposite side; an electrically conductive bracket (15) attached to the frame for coupling to a conveyor line; and an electrically conductive surface area (24) affixed against an irregular portion of the electrically non-conductive surface and electrically connected to said frame.



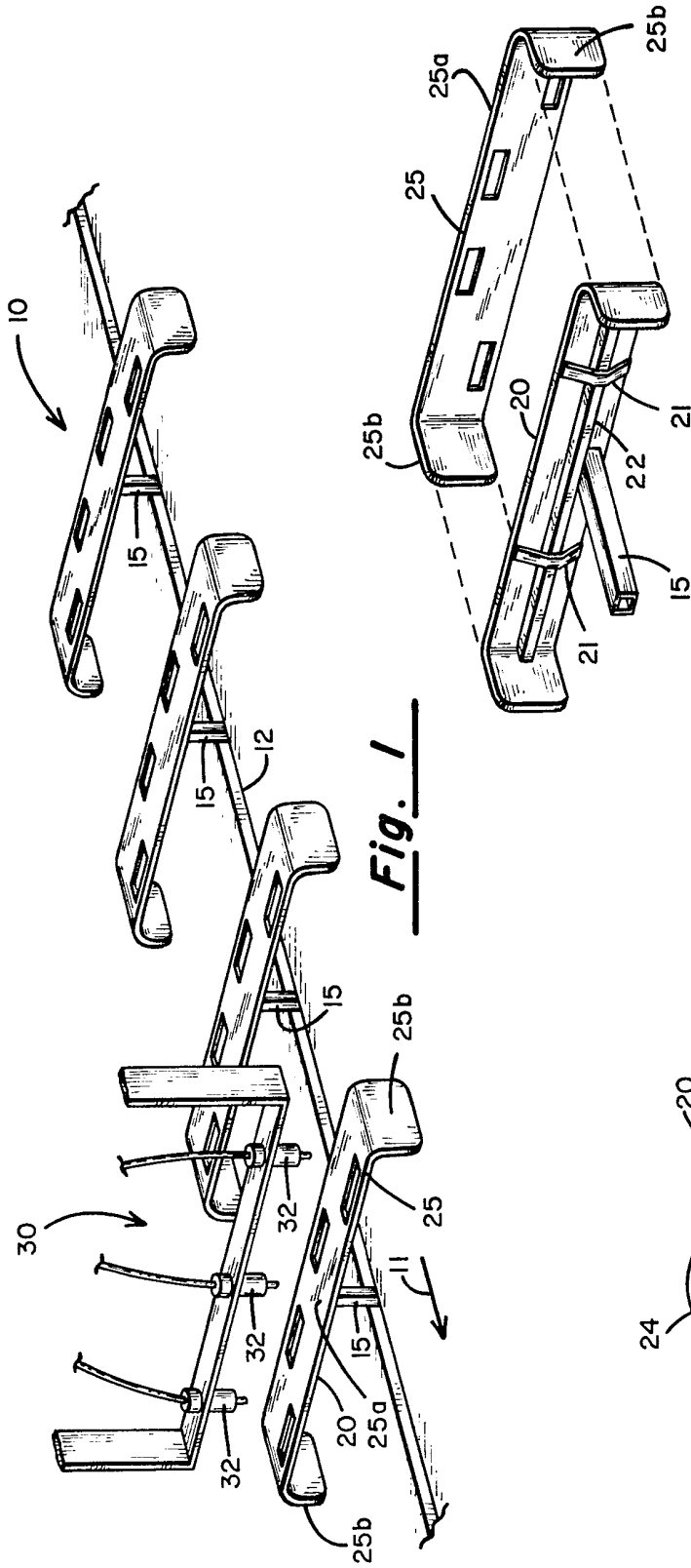


Fig. 1

Fig. 2

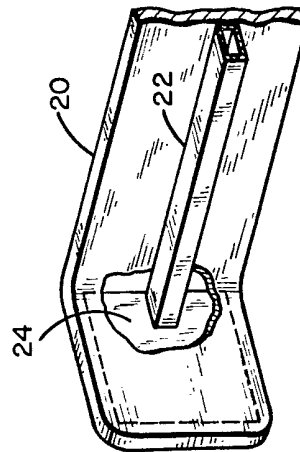


Fig. 3

SPECIFICATION

Support fixture

5 This invention relates to support fixtures for holding irregular shaped electrically non-conductive articles for electrostatic paint spraying. The articles may be large and for use as components of automobile and truck manufac-

10 ture.
In recent years, automobile construction has increasingly become dependent upon the use of component parts made from plastics and other flexible, electrically nonconductive materials. Such materials prove advantageous from both the cost and weight standpoint, and when used as nonstructural component parts of an automobile they serve their intended function equally as well as sheet metal component parts formerly served. Frequently such parts are found in the interior of the automobile in such places as the dashboard, door panels, etc. They are also found frequently in the front and rear of the automobile, forming "fascia" bridging between the automobile bumper and body. Such parts are usually manufactured from reaction injected molded urethane, which provides a smooth exterior finish and which may be painted to match the external body colours of the automobile.

15 However, the painting process of such urethane parts requires relatively high paint cure temperatures, in the neighbourhood of 120°C (250°F), and at such temperatures these urethane parts tend to deform and sag if unsupported. It is therefore necessary to provide some form of support fixture for these parts during the paint curing process.

20 In the past, support fixtures for urethane parts have been manufactured from either electrically conductive or non-conductive material. In the case of a conveyor line spray booth utilizing conventional air spray guns, the choice of support fixture is only of secondary importance, for the spray guns are typically directed, using manual or automatic means, to be positioned to coat uniformly all surfaces of an article. Since these surfaces are frequently very irregular, being formed to cover the space between wrap-around automobile bumpers and fender and grill work, the use of air spray guns frequently required an operator to ensure that all surfaces were uniformly and adequately coated.

25 The use of electrostatic paint spraying equipment is increasingly being utilized by the automobile manufacturing companies, primarily because of the lower amounts of paint overspray which is generated. Less paint overspray means that less paint is required to coat uniformly a given article, and also means that less waste paint must be collected and recovered from the atmosphere. Both of these factors tend to reduce the cost of the spray painting operation of automobiles. Electrosta-

tic paint spraying techniques have been difficult to apply to electrically non-conductive articles such as the urethane articles, for these electrically non-conductive parts are not easily conditioned to provide the electrostatic attractive forces necessary for electrostatic paint spraying. The well known characteristic of electrostatic paint spraying, namely improved "wrap", which enhances uniformity of coating on irregular surfaces, is difficult to achieve when electrostatically spraying electrically non-conductive articles. Therefore electrostatic paint spraying equipment, for all its other advantages, has proven less than completely effective in the spraying of such articles.

30 According to the present invention there is provided a support fixture for holding an irregular shaped electrically nonconductive article for electrostatic paint spraying, comprising: an electrically non-conductive surface conforming to said irregular shaped article and having one side arranged for at least partially nesting against said irregular shaped article; an electrically conductive frame affixed to said non-conductive surface on a side away from said one side; an electrically conductive bracket attached to said frame and adapted for coupling to a conveyor line; and an electrically conductive surface area affixed against an irregular portion of said electrically nonconductive surface, and electrically connected to said frame.

35 Said electrically non-conductive surface may include a first portion generally orthogonal to a second portion. Said electrically conductive surface area may be affixed against said first portion.

40 In one embodiment said electrically non-conductive surface is formed of fibreglass material. Said electrically conductive surface area may be moulded into said fibreglass material. Said frame may be moulded into said fibreglass material.

45 Said bracket may be welded to said frame. The invention is illustrated, merely by way of example, in the accompanying drawings, in which:-

50 *Figure 1* is a pictorial view of a conveyor line paint spraying apparatus;

55 *Figure 2* shows a support fixture according to the present invention and an irregular-shaped article to be painted; and

60 *Figure 3* is an expanded view of a portion of the support fixture of Fig. 1.

65 Referring first to Fig. 1, there is shown a conveyor line 10 which is representative of the type of conveyor lines utilized in automobile manufacturing plants. A track 12 is recessed into a floor, and contains a driving chain (not shown) or other drive means moving generally in the direction of an arrow 11. A plurality of brackets 15 are coupled to the driving chain associated with the track 12 at spaced intervals, so that the brackets 15 are conveyed along the conveyor line 10. Each of

the brackets 15 is attached to a conveyor support fixture 20 according to the present invention which hold an article 25 to be sprayed. In Fig. 1, the articles are positioned generally horizontally, although it is to be recognized that other configurations and positions are possible.

At an appropriate point along the conveyor line 10 a paint station 30 is provided. The paint station 30 includes a plurality of paint spray guns 32 which are actuated as an article 25 moves through the paint station, to provide a uniform coating of paint over the surfaces of the article 25. It is to be noted that the article 25 is generally irregular in shape, and as shown in Fig. 1 includes a generally horizontal portion 25a and generally orthogonal portions 25b. This configuration is typical of the nature and form of articles to be painted in automobile manufacturing plants. The spray painting characteristics of the spray guns 32 are adjusted so as to provide a uniform paint film coating over the entire surface of the portion 25a, and also to provide a similar uniform film coating over the surfaces of the portions 25b.

Fig. 2 is an isometric view of the support fixture 20 and the article 25. The support fixture 20 is sized to nest at least partially into the irregular shape of the article 25, so as to form a full and complete support surface for all of the irregular surface features of the article 25. The back side of the support fixture 20 has a rigid frame 22 attached thereto, the frame 22 also being affixed by a weld or other convenient means to the bracket 15. The frame 22 may have any geometric configuration necessary and convenient for a specific article. If necessary, the frame 22 may have vertical support members 21 in order to provide a more rigid support fixture 20. The respective ends of the frame 22 are each electrically and mechanically connected to a metallic sheet 24 (Fig. 3). The metallic sheet 24 is formed of a particular area and shape for any specific article to be sprayed according to the principles hereinafter recited. The metallic sheet 24 may be moulded into the surface of the support fixture 20, if the surface is constructed of fibreglass or other electrically non-conductive material. The metallic sheet 24 may be a metal plate or metal powder, and may be formed into the body of the support fixture 20. This is particularly advantageous when the support fixture 20 is formed of fibreglass in a mould, for the metallic sheet 24 may then be moulded into the body of the support fixture 20.

Fig. 3 is an expanded view of a portion of the support fixture 20, illustrating the connection between the frame 22 and the metallic sheet 24. It is to be noted that the metallic sheet 24 is generally disposed along an irregular surface section corresponding to the most irregular surface portions of the article

25. In the example of Fig. 3, a wrap-around part is contemplated having generally orthogonal portions 25b extending from the generally flat portion 25a. In this case, the metallic sheet 24 is positioned so as to be adjacent the portions 25b for reasons which will be hereinafter described. Other configurations are equally possible, and it may be generally stated that the metallic sheet 24 or a portion thereof may be selectively positioned adjacent any irregular surface area of an electrically non-conductive part so as to enhance the uniformity of the spray coating film in that area.

In operation, the article 25 is nested over the support fixture 20 during a preparatory step to the spray painting operation. Once this is done, the support fixture 20 is coupled to the conveyor line via the bracket 15, and is propelled along the conveyor line toward the paint spray station 30. The article to be sprayed is generally horizontally positioned and upwardly facing relative to the spray guns in the paint station 30.

It is presumed that the spray guns in the spray station 30 are of conventional electrostatic type, and are triggered by movement and position of the conveyor line 10. As the article 25 approaches a position beneath the spray guns the spray guns are actuated to provide an electrostatic charge current and paint emission toward the article 25. The electrostatic spray forces generated by their respective guns are deflected and, to a large extent concentrated, by virtue of the presence of the metallic sheet 24 selectively positioned behind an irregular portion of the portion 25. This results in an increased density of electrostatic field lines of force developed between the spray guns and the region adjacent the metallic sheet 24, and tends to convey proportionally larger quantities of paint toward that region. The portion 25a of the article 25, being directly beneath the spray guns, receives very little electrostatic assistance in the spray operation, for little is needed, and the net result is that the entire surface or article 25 is uniformly coated with paint.

In a typical operation it has been found that spray guns positioned approximately 30 cm (12 inch) above a moving conveyor line can uniformly deposit a paint film having a thickness of 1.5 μm (0.0006 inch) over the entire exterior surface area of the article, even when the article has a generally orthogonal wrap-around configuration.

It is necessary to design the shape and configuration of the support fixture 20 and the metallic sheet 24 according to the particular needs and configuration of a specific article, but once this has been accomplished the configuration may be reproduced many times in order to convey a great many identical parts through the paint station 30. Thus follow up and touch up operations which are

otherwise required, may be eliminated, and maximum utilization of a limited quantity of paint is achieved.

5 CLAIMS

1. A support fixture for holding an irregular shaped electrically non-conductive article for electrostatic paint spraying comprising: an electrically non-conductive surface conforming
10 to said irregular shaped article and having one side arranged for at least partially nesting against said irregular shaped article; an electrically
15 conductive frame affixed to said non-conductive surface on a side away from said one side; an electrically conductive bracket
20 attached to said frame and adapted for coupling to a conveyor line; and an electrically conductive surface area affixed against an irregular portion of said electrically non-conductive surface, and electrically connected to said frame.
2. A support fixture as claimed in claim 1 in which said electrically non-conductive surface includes a first portion generally ortho-
25 gonal to a second portion.
3. A support fixture as claimed in claim 2 in which said electrically conductive surface area is affixed against said first portion.
4. A support fixture as claimed in any
30 preceding claim in which said electrically non-conductive surface is formed of fibreglass material.
5. A support fixture as claimed in claim 4 in which said electrically conductive surface
35 area is moulded into said fibreglass material.
6. A support fixture as claimed in claim 4 or 5 in which said frame is moulded into said fibreglass material.
7. A support fixture as claimed in any
40 preceding claim in which said bracket is welded to said frame.
8. A support fixture substantially as herein described with reference to and as shown in the accompanying drawings.