Dec. 6, 1966 R. A. GARRISON ETAL 3,289,241

DEVICE FOR APPLYING COATING MATERIALS IN STRIPS

Filed Sept. 24, 1964

Fig 1.

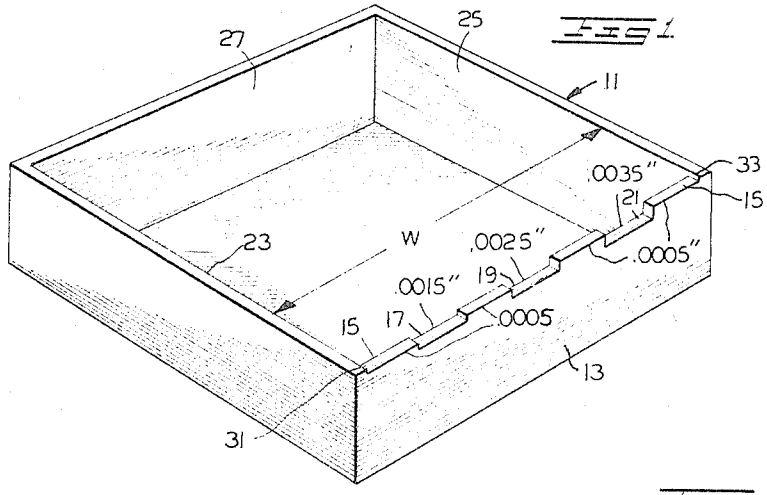


Fig 2.

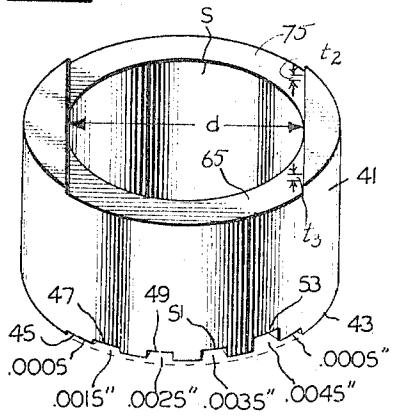


Fig 3.

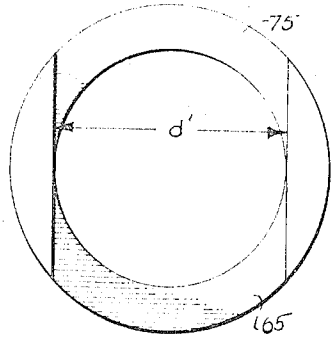


Fig 4.

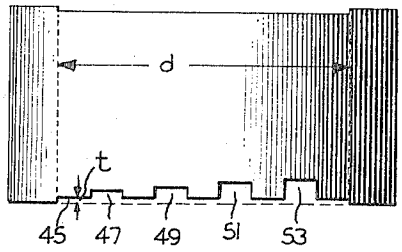
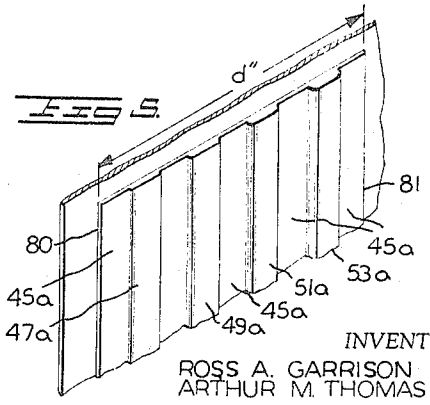


Fig 5.



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DEVICE FOR APPLYING COATING MATERIALS IN STRIPS

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8 Claims. (Cl. 15—595)

The present invention relates to an improved device for applying coating materials in strips of controlled dimensions. It has particular application to a means by which paint, or varnish, or like materials, may be applied in strips or stripes, with a high degree of accuracy and reproducibility, to surfaces such as test panels. Tests of this type are made in large numbers to determine the tendency of the coating material to flow or sag on various surfaces, variously oriented.

It is highly desirable to be able to apply paint and the like to a test panel in such a way as to simulate closely its behavior when applied by conventional means to conventional surfaces. The present invention has particular utility for such purposes but its use is not limited thereto.

For some time the prior art has recognized the need for an applicator or gaging device that would apply one, or preferably more than one, stripe of paint of carefully predetermined thickness and also predetermined width to a surface such as a test panel. Scrapers and blades of various types and configurations of course have been long used for applying adhesives as well as paints and other plastic materials to all kinds of surfaces. It has even been suggested, specifically, that separate plural paint stripes of various thickness might be applied simultaneously and side by side in spaced relationship to test surfaces. A multiple notch blade has been proposed for this purpose—See Reynolds & Larson in "Paint and Varnish Production," August 1958, page 48. Such devices have shown some utility but they are not entirely satisfactory for purposes of the present invention.

In general, prior art devices of the types mentioned above do not successfully simulate actual conditions when paint is applied with brush or roller, or by spraying, on conventional surfaces. Being designed to apply spaced and separate stripes, which may vary in thickness, the stripes are separated by bare or uncoated areas. The tendency of such a separate and narrow stripe of paint to sag or flow is not the same as if it were applied as part of a fully coated surface. It has been found, according to the present invention, that the normal sagging tendency of a paint composition, applied in a conventional manner, is much more closely simulated if separate strips of such paint are integrated with an underlying layer or body which covers the whole surface.

That is to say that the tendency of a stripe of paint or analogous coating composition to sag or flow, when applied to a surface that is coated over a continuous area, i.e. which has a film of coating material under and alongside the stripe, is quite different from that of a discrete stripe applied to a dry or uncoated surface. A particular object of this invention is to design an applicator blade or device that is suitable for applying one or more stripes of predetermined thickness or thicknesses while simultaneously applying a full surface coating. It is perhaps more accurate to say that the device will apply a thin full surface coating and at the same time apply separate stripes which are superimposed over or integrated with the full surface film.

In the prior art, certain test procedures have involved the disposition of a thin coating of paint or the like, using a blade designed to control the thickness of the coating. As far as applicants are aware, however, this has not generally been very satisfactory. It has usually been considered quite impossible to make a paint draw-down of controlled width which also has clean and distinct edges. The blades or film laying devices of the prior art have usually had to scrape up some of the paint that was deposited on the surface along each edge of the blade or applicator. The result generally has been that the edges of the applied paint stripe were left ragged and uneven. A test panel bearing a paint coating having such edges is not very suitable for accurate determinations of the flow or sag tendency of this coating material.

Hence another object of the present invention is to so design a blade or applicator that it will apply a layer of uniform thickness, uniform width, and distinct clean edges. This object is accomplished, according to the present invention, by designing a hollow, peripherally walled blade of such configuration that paint will not be applied where it must be scraped off.

The blade, accordingly, is so designed that the scraping or gaging element which determines the thickness of the paint is of precisely the same width as the paint applicator that precedes it. Using a hollow walled, open bottomed structure, the shallow paint slot, having a scraping or gaging element parallel to and closely spaced from the paint receiving surface, terminates on either side edge exactly at the inner wall surface of the hollow structure. In the case of a hollow right circular cylinder, the slot has terminal ends at and tangent to the inner circular wall surface. In other forms, the slot terminates at the full inner width of the paint container, whatever form it may assume.

Moreover, the edges of the slot are perpendicular to the base, or to the paint receiving surface, when the applicator is resting thereon. They are sharp and clean and the edges of the applied stripes are sharp and clean too. For this reason, the blade or applicator of the present invention leaves no "border" beyond its edge where paint has been applied and scraped off. The applicator slot is accurately milled or otherwise machined and is carefully aligned with the inside surface of the peripheral wall which supports it.

The device of the present invention can assume several specific shapes or forms, within the limitations previously explained. Basically, it is a hollow, open-ended box or cylinder having walls of sufficient thickness to give it a rigid and properly machinable structure. Across the full internal width of this hollow structure, a shallow slot is milled out to a depth corresponding to the thin layer of paint which is to be applied uniformly over a relatively wide area of the test panel. The new edge serves as a scraper or blade element to lay down the basic coating. Into this element are cut several notches of varying depths. Their purpose is to apply superimposed strips which are really integral with the base layer but which have their own clean, well-defined edges. By means of these stripes, the sagging or flow tendencies of the coating material may be evaluated.

For a typical paint, the base coating thickness may be from about 0.3 to 1.0 mil but this value may vary considerably with different compositions. The deeper notches or slots may vary in depth from as little as 0.5 mil or less to as much as 20 mils or more. For conventional paint, the useful range for the stripe forming slots usually will be between about 1 and 10 mils, in addition to the base coat thickness of 0.3 to 1 mil or so.

It appears to be important that the sides of all the notches be sharp and vertical, particularly for testing the sag values of paints. Experience has shown that the so-called wet-edge tests can be very accurately made with the device of this invention. It is applicable not only to oil paints but to coating materials comprising

many other materials including rubber and latex solutions and suspensions.

The invention will be more fully understood by reference to detailed description of particular embodiments presently preferred. For this purpose, reference will next be made to the accompanying drawing wherein:

FIG. 1 is a perspective view of one form of the device, dimensions of the milled slots or grooves being relatively exaggerated.

FIG. 2 is a perspective view of another form.

FIG. 3 is a top view of the device of FIG. 2.

FIG. 4 is a front elevational view of the device of FIG. 2.

FIG. 5 is a fragmentary view of a test panel coated in strips of varying thickness by means of the device of FIG. 2.

Referring now to the drawing, FIG. 1 shows a rectangular blade comprising a hollow box **11** having a front wall **13** which bears the paint gaging slots or notches **15, 17, 19** and **21**. The device has vertical side walls **23** and **25** and a rear wall **27**. It has an interior width *w*. For convenience of description, it is shown inverted, the notches **15, 17, 19**, etc. normally being on the bottom. The box is open at the top (shown as bottom, FIG. 1) so that paint can be poured into it conveniently.

The slot **15** is a very shallow one, shown for illustration as being 0.0005" or ½ mil deep. It extends the full inner width *w* of the box **11** for the reasons described above. Its ends **31, 33** are vertical and in accurate alignment respectively with the inside surfaces of side walls **23, 25**. Ignoring slots **17, 19** and **21** for the moment, it is obvious that the shallow slot **15** would deposit a thin, uniform layer of paint when inverted, filled with paint, and slid over a smooth, flat surface. The vertical edges **31, 33** in alignment with the inside walls **23, 25** produce clean sharp edges on the applied paint strip. The deeper notches **17, 19, 21** could, in fact, be eliminated if it were desired to apply only a single thin layer.

Usually it is desirable to apply simultaneously a plurality of paint stripes of different thickness so that comparative sag rates or flow rates may more intelligently be determined. Hence the slot or notch **17** is made relatively shallow, slot **19** is of medium depth and slot **21** deepest of all. These should cover the range of thicknesses that are likely to be useful for the particular paint or coating under test. When the device is then loaded with paint and pushed over the surface, the uniform thin layer, produced by slot **15**, is augmented by additional paint coming through slots **17, 19** and **21**, respectively. The side edges of these slots are each sharp and vertical and the side lines of the raised layers or strips of paint flowing through them are straight and clean. They do not remain vertical in the strict sense, of course, but they make a clear line by means of which the sag or flow rate of each raised strip may readily and accurately be observed. The thicker strips will, of course, flow or sag more rapidly and to a greater extent than the thinner layers. By comparing sag against no sag in the respective strips, a sag index can quickly be determined.

Referring to FIGS. 2, 3 and 4, a cylindrical blade is shown which has some advantages over the form shown in FIG. 1 for some purposes. This device comprises a hollow cylinder **41** which is made to accurate dimensions, wall thickness, etc. with its end surfaces perpendicular to its axis. The lower end **43** is provided with the wide shallow slot **45**, comparable to slot **15** of FIG. 1. This slot is precisely as wide as the inside diameter *d* of the cylinder **41**. It has a depth *t* of the same general magnitude as slot **15**, i.e., appropriate to lay down a thin uniform layer of the coating composition on a smooth surface. The side edges of the slot **45** are vertical and tangent to the inside circular surface S of cylinder **41**. Slots **47, 49, 51** and **53** are progressively deeper, appropriate but not limiting dimensions being shown for each of them.

As shown, the cylinder **41** may also have a rather shallow slot **65** in its front upper edge and a still shallower slot **75** in its rear upper edge. See FIGS. 2 and 3 especially. The rear slot **75** may have an appropriate depth t_2, FIG. 4, for thin paint or varnish. The front slot **65** has a depth t_3 appropriate for somewhat thicker paint. To use blade elements **65** or **75**, the device is inverted and moved in the appropriate direction to deposit the coating material through the appropriate slot. Under normal conditions, surface tension in the material is sufficient to prevent the paint flowing through either slot before the blade is moved. Hence the blade of FIGS. 2, 3 and 4 is quite versatile. It can be used (a) to deposit a very thin uniform coating through slot **75**, (b) to deposit a slightly thicker uniform coating through slot **65**, or (c) to deposit a coating of multiple thickness through slots **45, 47**, etc.

Referring to FIG. 5, there is shown, fragmentarily, a coated panel which has had paint applied by the device of FIG. 2. The thin layer **45***a*, of uniform thickness where not supplemented, is supplemented by the extra strips **47***a*, **49***a*, **51***a*, and **53***a*, of progressively greater thickness. This coated panel may be held in any desired position, vertical, horizontal or otherwise to determine the sagging tendency or flow rate, etc., of the material applied thereto. As in the case of the device of FIG. 1, the clear, sharp lines **80, 81**, along the side edges of the basic coat result from the alignment of the side edges of slot **43** with the interior walls of the blade. Likewise, clean lines are formed on each side of the raised strips **47***a*, **49***a*, etc., due to the clean vertical edges of the respective deeper slots **47, 49**, etc.

To compare the device of this invention, corresponding essentially to that of FIG. 1, with a prior art device which did not lay down a base substrata, sag ratings were obtained on nine commercial paints made by various manufacturers. Most of these are widely sold in the United States. The data show particularly that the paints that have the greatest sagging tendency (low sag value) sagged more on the device of this invention (second column of Table I) than with the prior art device (first column). On the other hand, paints having lower sagging tendencies (high sag values) scored about the same. These results confirm the expectations of experienced paint manufacturers that sagging on a painted surface differs from that on an unpainted surface. The thicker stripes are generally the only ones that tend to sag. These are more removed from the surface than the thinner stripes. Results are shown in Table I.

TABLE I.—SAGGING RESULTS

	Old	New
Mfr. A Latex Flat 1350—Green	16	14
Mfr. B Porch Floor and Deck Enamel—Gray	3	2
Mfr. A Trim White 180	12	12
Mfr. A Flat Latex 4580—Brown	14	14
Mfr. A Anti-Rust Finish 827—Black	14	14
Mfr. C Sash and Trim 1-352—White	8	6
Mfr. D Quick Drying Enamel 914—Daffodil	6	5
Mfr. C Wallhide Odorless Alkyd—Green	14	14
Mfr. E Alkyd Sani-Flat 204 36 Dresden Blue	12	12

It will be appreciated that the lower values in the table above are the most significant ones.

It will be obvious that the device of this invention can assume other forms, that the various slots may be differently arranged and that other modifications may be made without departing from the spirit and purpose of the invention. It is intended by the claims which follow to cover such variations as would suggest themselves or be obvious to those skilled in the art as broadly as the prior art properly permits.

What is claimed is:

1. A device for applying a paint-like composition to a sampling panel to test its tendency to flow, which comprises an enclosure structure having an essentially plane and smooth open bottom end interrupted in part of its periphery by a shallow slot of width essentially equal to the full inside width of said structure to provide a gaging element spaced from a plane surfaced panel when the device is resting on said panel by about the desired thickness of a coating of said composition, and additional slots of greater depth formed in said element to apply stripes of thicker coating to selected parts of the panel as the device is moved along the panel while containing the composition.

2. Device according to claim 1 wherein the side surfaces of all said slots are substantially perpendicular to said gaging element.

3. Device according to claim 1 wherein the structure is essentially a hollow right circular cylinder.

4. Device according to claim 1 wherein the structure is essentially a hollow right circular cylinder having at least one slot in each end.

5. Device according to claim 1 wherein the structure is essentially a hollow right circular cylinder having in one end two wide shallow slots of different depths but both of a width substantially equal to the full inside diameter of the hollow cylinder.

6. Device according to claim 1 wherein the device is essentially a hollow rectangular structure having the shallow slot cut into one side wall and extending across the full inside width of the structure.

7. A paint draw-down blade in the form of a short section of a hollow right circular cylinder having generally parallel end surfaces perpendicular to its axis, an end surface having a shallow slot of even depth formed across the full inside width of said cylinder, and vertical edge surfaces formed perpendicular to said end surface and essentially tangent to the inner wall surface of the hollow cylinder which vertical surfaces form the opposite ends of said slot, the other end of said cylinder having at least one shallow slot of similar width, and a plurality of supplemental deeper slots cut into at least one of said shallow slots.

8. A device for applying a paint-like composition to a plane surfaced sampling panel to test its tendency to flow, which comprises an enclosure structure having an essentially plane and smooth open bottom end interrupted in part of its periphery by a shallow first slot to provide a gaging element spaced from the plane surfaced panel when the device is rested on said panel by about the desired thickness of an underlying coating of said composition, and at least one additional second slot of greater depth than said first slot formed in said element in a portion of said first slot to apply a stripe of thicker coating to selected parts of the panel as the device is moved along the panel while containing the composition.

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