July 26, 1960 S. A. LOPENSKI 2,946,696

MASKING METHOD AND APPARATUS

Filed Dec. 31, 1957

Fig. 1.

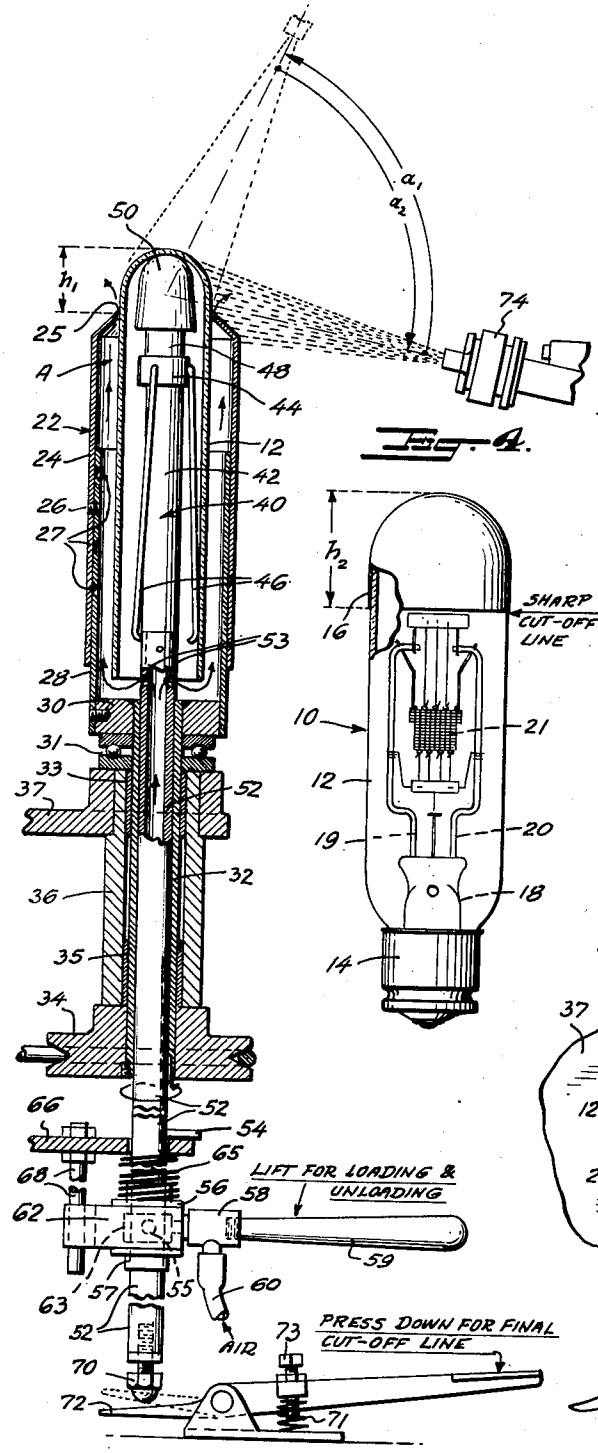


Fig. 2.

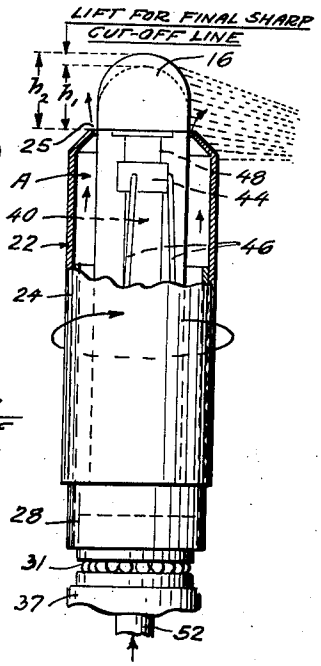
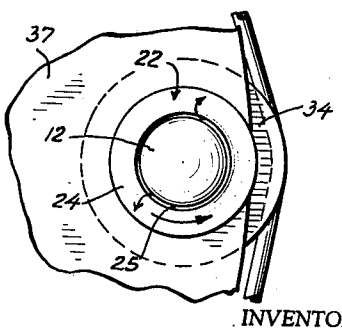


Fig. 4.

Fig. 3.



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MASKING METHOD AND APPARATUS

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8 Claims. (Cl. 117—38)

This invention relates generally to the selective treatment of articles and, in particular, to a masking method and apparatus for shielding a selected portion of a cylindrical article such as a projection lamp bulb from sprayed coating material.

During the course of manufacturing certain articles it is often necessary or desirable for functional or purely decorative reasons to process or coat a particular part of the article or area of its outer surface. In the electric lamp industry, for example, it has become the standard practice to coat the top of a projection lamp bulb with an opaque layer of suitable high-temperature material such as ceramic paint or the like in order to prevent the leakage of stray light upwardly through the projector housing. Heretofore, this was accomplished by shielding the main body portion of the bulb with a tight-fitting mask of rigid material and spraying the exposed top portion until a coating of the desired opacity was obtained. The utilization of a tight-fitting mask of rigid construction, however, was inherently impractical inasmuch as bulbs which were slightly oversize could not be inserted into the mask and those which were undersize were not efficiently shielded, the latter condition resulting in a smeared or uneven line of demarcation between the coated and uncoated areas or so-called "cut-off" line which necessitated a time-consuming and costly cleaning operation of both bulb and mask.

In an attempt to overcome this problem the masks were made slightly oversize and lined with sponge rubber or the like in order to compensate for the variations in the bulb dimensions and thus maintain the intimate surface contact necessary to effectively seal off the area under the mask from the sprayed particles. The inability of masks of this character to withstand the high ambient temperatures required to set and cure the coating and their inherent short life necessitated the frequent inspection and conditioning or replacement thereof in order to insure coatings of acceptable quality thus rendering this manner of masking not only impractical from both a quality control and cost standpoint but unsuitable for use in high-speed bulb coating equipment.

In the copending application Serial No. 706,436 of J. Petro entitled, "Masking Method and Apparatus," which application is filed concurrently herewith and assigned to the instant assignee, there is disclosed and claimed an improved masking technique and means which obviate the foregoing deficiencies of the prior art structures by utilizing, in combination with a rigid loose-fitting shield, a flow of pressurized gas in the space between the shield and article to seal off the enclosed portion of said article from the processing medium. The gaseous outflow from the shielding member is thus employed as the protective agent rather than the intimate surface contact of the shield with the article as heretofore. While this arrangement affords distinct advantages over the prior art practices, particularly with regard to the durability of the apparatus and the ease of loading, it was found that when spray coating the end of an article, such as the top of a tubular lamp bulb, the desired neatly-defined cut-offs would only be obtained if the gas flowing out of the shield were maintained at a velocity greater than that of the impinging particles. This requirement, in conjunction with the fact that when coating the top of the bulb the spray was of necessity aimed in such a direction as to oppose the gaseous outflow, rendered this mode of masking rather critical. Thus, if the gun were placed too close to the bulb or the pressure of the air supplied to the gun or shield were improperly controlled or balanced, then some of the sprayed particles would penetrate the gaseous barrier and enter the shield resulting in a ragged cut-off line or graduated frosted effect thereat, which effect is commonly referred to as "feathering." These defects, while they did not impair in the least the utility of the coating, were undesirable from an appearance standpoint.

It is accordingly the general object of the present invention to provide a method and means for selectively treating an article with a pressure-applied medium without deleteriously affecting the quality of the finished product or complicating the processing operation.

Another and more specific object of the invention is to provide a convenient and inexpensive method of masking the body portion of an article from sprayed particles so that only a selected end portion is processed and a sharp accurately-oriented line of cut-off is produced thereon that is substantially even and free of "feathering."

Still another object of the invention is the provision of masking apparatus which, while inherently trouble-free and capable of withstanding high-temperature conditions with a minimum of maintenance and replacement of parts, will consistently produce a sharp neatly-defined cut-off line at a preselected part of an article despite variations in the dimensions of said article and the manner in which the processing medium is applied.

The aforesaid objects of the invention, and others which will become apparent as the description proceeds, are achieved by inserting the part of the article to be protected into a loose-fitting shield in the manner disclosed in the aforementioned copending application Serial No. 706,436 of J. Petro and then manipulating the article (or shield) so that the article is recessed within the shield a predetermined distance in excess of that required to produce the desired cut-off during that portion of the spraying cycle when an influx of sprayed particles is most likely to occur. After the end of the article has been coated, the spray gun is positioned abreast of or slightly below the edge of the shield and the article raised the aforesaid predetermined distance to expose the recessed portion and effect the final cut-off. Thus, the "region of final cut-off," so to speak, is exposed to the spray only during the final phase of the coating operation when the sprayed particles transversely impinge on the article and can be easily deflected by the shield to produce a cut-off free from any "feathering" or raggedness.

The present invention, therefore, constitutes an improvement over the masking arrangement disclosed and claimed in the above-mentioned copending application Serial No. 706,436 of J. Petro in that while the same structural components are used the desired effect is achieved by properly manipulating the various elements rather than by maintaining a carefully controlled flow of pressurized gas from the shield. The underlying principle of this invention is thus basically different and provides a more practical solution to the problem of coating the end of an article with a pressure-applied processing medium since the shield and not the gaseous outflow therefrom serves as the primary protective or masking means which determines the location and character of the cut-off. While a gaseous flow may be

utilized as an auxiliary protective agent to accelerate the setting up of the coating material and eliminate the possibility that the backwash or overspray generated by the jet of atomized air may force particles into the shield, experience has shown that if the shield and article are properly manipulated with respect to each other and a soft spray pattern is employed acceptable coatings can be produced without introducing a gas into the shield.

For a better understanding of the invention reference should be made to the accompanying drawing wherein:

Fig. 1 is an elevational view mainly in section of a spray type bulb-coating apparatus embodying the present invention and showing the line of movement of the spray gun with respect to the top of the loaded bulb during the coating operation;

Fig. 2 is a fragmentary elevational view, partly in section, of the apparatus shown in Fig. 1 illustrating the orientation of the bulb with respect to the shield during the main portion of the spraying cycle and the last phase thereof;

Fig. 3 is a plan view of the apparatus shown in Fig. 1; and

Fig. 4 is an enlarged elevational view of a projection lamp incorporating a bulb of the type being processed in Figs. 1 to 3, a top part of the bulb being broken away and in section to more clearly illustrate the character of the coating thereon.

Although the principles of this invention are broadly applicable to the selective treatment or coating of various types of articles having diverse shapes, the invention is especially suited for use in a spray type coating machine for applying an opaque layer of finely-divided material to the tops of cylindrically hollow articles such as projection lamp bulbs and hence has been so illustrated and will be so described.

With specific reference now to the drawing, in Fig. 4 there is shown a conventional type incandescent projection lamp 10 comprising, in general, a tubular bulb **12** one end of which is closed to form a rounded end portion and the other sealed to a re-entrant stem **18** and fitted with a prefocus type base **14**. In accordance with the usual construction employed in lamps of this character (a representative sample of which is shown and described in U.S. Patent No. 2,140,977), the re-entrant stem **18** axially projects into the bulb **12** and supports a pair of spaced longitudinally extending leads **19** and **20** between which a sectionally-coiled tungsten filament **21** (of either the well-known monoplane or biplane type) is supported by means of suitable top and bottom bridge assemblies. The lamp **10** is designed to be burned in the base down position shown in Fig. 4 so that the closed end of the bulb **12** constitutes the top portion of the lamp **10** which portion, in accordance with the aforementioned practice, is provided with an opaque coating **16** of suitable high-temperature material such as ceramic paint or the like to intercept undesirable upward components of stray light emanating from the filament **21**. As will be obvious, it is highly desirable that the coating material be applied in such a manner that only a predetermined top portion h_2 (see Figs. 2 and 4) of the bulb be coated and that the cut-off line be sharply defined, that is, substantially free from any raggedness or "feathering," so that the coating as applied is of acceptable quality from an appearance standpoint without subjecting the bulb to a costly and time-consuming cleaning operation.

The essence of this invention resides in the method and means for masking a predetermined body portion of the bulb **12** during the spraying operation so that the cut-off line is not only precisely located but free from appearance defects such as "feathering" or the like and these will be hereinafter described.

In Fig. 1 there is shown an apparatus for spray coating a selected top portion of a projection lamp bulb **12** according to one embodiment of the present invention. The apparatus comprises generally a bulb-supporting assembly **40** and a centrally apertured bulb-enclosing casing or shield **22** of rigid non-porous material such as sheet metal or the like arranged one within the other in concentric upstanding relation so that the shield **22** is spaced from and encloses a predetermined segment of the top section of the bulb-supporting assembly **40**. As shown in Figs. 1 to 3, the bulb **12** is inserted into the shield **22** and threaded over and firmly seated on the bulb-supporting assembly **40** to thus enclose the body portion of the bulb and leave a selected top portion h_1 thereof exposed for coating as by an atomized jet of finely-divided material from a suitable spray gun **74** well-known in the art.

In order to insure that the coating material is applied evenly, the bulb **12** is desirably rotated at a suitable speed during the coating operation. This may be conveniently accomplished by mounting the sheld **22** on a spacing ring **30** carried by a support tube **32** which is rotatably held by means of a thrust bearing **31** and bushings **33** and **35** in upstanding coaxial relation within a stationary housing **36** affixed to the frame **37** of the machine. Thus, when the support tube **32** is rotated in the direction shown in Fig. 1, as by a well-known drive pulley **34** secured to the end of the tube, the shield **22**, bulb-supporting assembly **40** (a portion of which is secured to the support tube **32**), and the bulb **12** seated thereon rotate as a unit. By virtue of the foregoing construction, however, the bulb-supporting assembly **40** and bulb **12** are reciprocably displaceable with respect to the shield **22** so that the bulb may be accurately positioned and controllably manipulated therein by properly actuating the lower end of said assembly, as viewed in Fig. 1 and hereinafter described.

In order to provide means for securely gripping the bulb **12** and introducing a suitable pressurized gas such as air into the interior of the shield **22**, as contemplated by the preferred embodiment of this invention shown in the drawing, the bulb-supporting assembly **40** is desirably fabricated in two sections, namely, an upper solid spindle **42** and a lower hollow spindle **52** conjoined in coaxial relation to form an integral elongated member, the latter spindle constituting the lower portion of said assembly and being slidably disposed within the support tube **32**. The upper spindle **42** terminates in a collar **44** having three radially-spaced finger-like elements **46** arranged (as shown in Figs. 1 and 2) to provide a rigidly anchored spider assembly adapted when compressed inwardly by the bulb **12** to resiliently engage and grip the interior wall surface of the bulb. The upper spindle **42** is provided with a tip element **48** which is covered by a thimble-like cap **50** of suitable shock absorbing material such as rubber or the like to provide a stop contoured to nest within the dome of the bulb **12** and accurately position the bulb on the supporting assembly **40**, as shown in Figs. 1 and 2. The closed end of the bulb **12** is thus used as the reference point in determining the line of cut-off, as hereinafter explained, so that equal segments of each of the bulbs are coated regardless of variations in the overall bulb length prior to the sealing-in operation.

The introduction of a suitable gas such as air under pressure into the shield **22** may be conveniently accomplished for the purpose hereinafter disclosed by utilizing the lower hollow spindle **52** as a conduit by proportioning said spindle so as to project slightly beyond the upper edge of the support tube **32** and a predetermined distance beyond the lower edge thereof and the attached pulley **34**, as viewed in Fig. 1. The end of the lower spindle **52** which protrudes into the shield **22** is provided with a plurality of apertures **53** to effect communication with the shield interior. The opposite end of the lower spindle **52** is closed by a set screw **70** and is provided with an aperture **55** which opens into a chamber **63** defined by a bracket **62** held in encircling relation with said spindle by a pair of flanged retaining rings **56** and **57**. The chamber **63**, in turn, connects with a pressurized air supply (not shown) through a flexible conduit **60** at-

tached to a T-shaped nipple 58 carried by said bracket. The bracket 62 is suitably forked or apertured (as shown in Fig. 1) to slidingly accommodate a stud 68 fastened to a horizontally disposed plate 66 secured to the frame 37 which stud is disposed in parallel relation with the axis of the support tube 32. Thus, the lower spindle 52 is anchored in coaxial alignment with the support tube 32 permitting the bulb-supporting assembly 40 to move freely longitudinally with respect to said tube and the shield 22. The rate of flow of the air from the pressurized source into the shield 22 may be controlled in any convenient manner as by an adjustable reducing valve (not shown) in the conduit 60.

The plate 66 projects beyond the lower spindle 52 sufficiently to provide a stop for an appropriately located pin 54 carried by the lower spindle 52 which thus limits the downward travel of the bulb-supporting assembly 40 and accurately positions the top portion thereof with respect to the shield 22 so that when said pin and plate are seated one against the other, a bulb 12 disposed on said assembly will protrude a predetermined distance h_1 (see Figs. 1 and 2) beyond the edge of th shield 22. A helical spring 65 interposed between the plate 66 and the flange of the retaining ring 56 maintains the pin 54 in firmly seated engagement with the plate 66 so that only a predetermined top portion h_1 of the bulb 12 is exposed when the bulb-supporting assembly 40 is in normally-recessed position within the shield 22. The set screw 70, in addition to sealing-off the end of the lower spindle 52, enables the overall length of the bulb-supporting assembly 40 to be precisely adjusted so that when said set screw and assembly are urged upwardly by means of a suitable lifting lever 72, as shown by the dotted outline of said lever in Fig. 1, a bulb 12 when in loaded position on said assembly will be raised an additional predetermined distance out of the shield 22 and a proportionately longer section h_2 of the bulb top exposed, as shown in Fig. 2. A set screw 73 carried by the lever arm in combination with an interposed spring 71 permits the distance the bulb 12 is raised out of the shield 22 to be accurately controlled and maintains the lifting lever 72 normally disengaged. To facilitate unloading, the bulb 12 may be raised even further out of the shield 22 against the action of the spring 65 by means of a handle 59 secured to the T-shaped nipple 58 carried by the bracket 62.

In order to accommodate bulbs of various standard lengths, the shield 22 is desirably fabricated in two sections, as shown in Figs. 1 and 2, namely, a movable sleeve 24 and a stationary sleeve 28 arranged in telescopic relation so as to vary the overall length of the shield by adjusting the position of a set screw 26 engageable at different points with apertures 27 in the movable sleeve. To minimize the number of sprayed particles which impinge on the gap between the bulb 12 and shield 22 and thus reduce the "incidence of leakage," so to speak, the free end of the movable sleeve 24 is tapered inwardly to define a central aperture which is only slightly greater in diameter than the maximum outer diameter of the bulb 12 to be accommodated thus providing, when said bulb is in centrally-loaded position on the bulb-supporting assembly 40, an annular escapement or constricted opening 25, as shown in Figs. 1, 2 and 3. As shown in Fig. 1, the movable sleeve 24 is of sufficient length that when the set screw 26 provided therein is disposed in the uppermost position in the stationary sleeve 28, the lowermost of the screw-apertures 27 remains covered by the movable sleeve thereby rendering the shield 22 substantially air tight regardless of the size of the bulb being processed. Thus, when the bulb 12 is seated in loaded position on the bulb-supporting assembly 40, the shield 22 in conjunction with the inner and outer surfaces of the bulb defines an air tight chamber A open to the atmosphere and the sprayed particles only through an annular constricted opening 25 which encircles the bulb

on a diametric plane at a predetermined point along its longitudinal axis, as illustrated in Figs. 1 and 2, thereby defining the line of cut-off and exposing a predetermined length (either h_1 or h_2 depending on whether or not the lifting lever 72 is actuated) of the bulb top for processing.

Operation

In processing the bulb 12 in accordance with the principles of this invention, the overall length of the shield 22 is first adjusted by inserting the set screw 26 in the appropriate one of the apertures 27 in the stationary sleeve 28. With the bulb-supporting assembly 40 in its normally-recessed position shown in Fig. 1, the bulb 12 is then inserted into the shield 22 and forcibly threaded over the bulb-supporting assembly 40 and the finger-like elements 46 until it is firmly seated against the cap 50 in coaxial and juxtaposed relation with the shield (as illustrated in Figs. 1 to 3) to thus define the aforementioned air tight chamber A and constricted opening 25. With the bulb 12 in this position a predetermined body portion thereof in excess of that desired to be shielded is enclosed leaving a length h_1 of the bulb top exposed, as above-described. The entire assembly is then rotated at a suitable speed by the drive pulley 34 and clean dry air, at a pressure sufficient to fill the chamber A and maintain an outward flow through the opening 25 during the coating operation, is fed from a suitable pressurized source into the shield 22 by means of the above-mentioned conduit 60, T-shaped nipple 58, and apertured lower spindle 52.

The spray gun 74 is then triggered and progressively swung along a diametric plane in an arcuate path a_1 from a position slightly below the horizontal to one just short of the vertical and back again along the path a_2 to thus scan the exposed top portion h_1 of the bulb 12, as shown in Fig. 1, until a coating of the desired opacity is obtained.

After the top portion of h_1 of the bulb 12 has been coated in the foregoing manner and the spray gun 74 has been returned to a position abreast of or preferably slightly below the edge of the shield 22, as shown in Figs. 1 and 2, the lifting lever 72 is actuated and the bulb 12 raised an additional predetermined distance, as for example ⅛ of an inch, out of the shield 22 to thus cause a proportionally longer length h_2 of the bulb top to protrude and expose the "final cut-off region," as illustrated in Fig. 2. This bring the final cut-off line into coinciding relation with the edge of the shield 22 and the opening 25 and extends the coating to the selected final line of cut-off. By virtue of the recessed position of the gun 74 and air flow from the opening 25, the main portion of the spray is deflected by the shield 22 and the chamber A is sealed off from the turbulence or backwash generated by the spray thus sharply terminating the coating 16 (see Fig. 4) at the final line of cut-off and obviating any blurring or "feathering" effects. After the coating operation has been completed and the coating material sufficiently set, the apparatus is brought to a stop whereupon the bulb 12 is raised further out of the shield 22 by means of the handle 59 to permit the uncoated portion of the bulb to be gripped and the bulb removed without smudging or otherwise disturbing the coating. The coating 16 is then cured as by baking in the usual manner. It will, of course, be obvious that the air fed into the chamber A, in addition to being clean and dry, may be heated to accelerate the setting-up of the coating material at the line of cut-off or means provided for applying the necessary heat to the coating to permit the curing process to be completed while the bulb is still being rotated on the machine.

Alternatively, experience has shown that if a soft spray is used and the opening 25 is made as narrow as practicable and the spray gun positioned well below the edge of the shield during the final phase of the spraying cycle to minimize the "incidence of leakage," the injection of air into the shield 22 may be eliminated without delete-

riously affecting the quality of the finished coating thereby even further simplifying the apparatus and coating operation.

After the coated bulb 12 has been removed, the handle 59 is released whereupon the bulb-supporting assembly 40 in response to the action of the spring 65 returns to its normally-recessed loading position and the foregoing cycle is repeated.

As will be apparent from the foregoing, the objects of the invention have been achieved by providing a method and means for masking a preselected body portion of an article from a pressure-applied processing medium and effecting in a simple and inexpensive manner a sharp and neatly-defined line of cut-off free from "feathering" or other appearance defects. In addition, by utilizing a loose-fitting shield of rigid construction in combination with a simple actuating mechanism for precisely controlling the relative position of the loaded article and the shield during the treating cycle and effecting the desired final line of cut-off, the masking apparatus is not only made inherently trouble-free and durable but convenient and simple to operate thereby rendering it especially suited for use in automated equipment.

While the present invention has been described in some detail by way of illustration and assembly for purposes of clarity and understanding in accordance with the patent statutes, it is understood that various changes and modifications may be made without departing from the spirit and scope of the invention.

I claim:

1. The method of masking a selected body portion of an article from a processing medium sprayed from a movable source which scans the exposed end portion of said article, and effecting a desired final line of cut-off which method comprises, inserting said article into a shielding member adapted to loosely receive the selected body portion to be protected and define therewith a chamber open to the atmosphere and normally accessible to said processing medium through a constricted opening which, in turn, defines the line of cut-off on said article, positioning said article so that a predetermined part thereof in excess of the said selected body portion to be protected is recessed below the edge of said shielding member while said medium source scans the exposed end portion of said article, placing said medium source abreast of and preferentially below the defining edge of said shielding member and constricted opening thereat after the aforesaid end portion has been processed, and then raising said article an additional distance out of said shielding member to expose the recessed predetermined part of said article which is in excess of the said selected body portion and thereby effect said desired final line of cut-off.

2. The method of masking a selected body portion of a cylindrical article from a processing medium sprayed from a movable source which scans the exposed end portion of said article and effecting a desired final line of cut-off which method comprises, inserting said article into an apertured shielding member adapted to loosely receive the selected body portion to be protected and define therewith a chamber open to the atmosphere and normally accessible to said processing medium through a constricted opening which, in turn, defines the line of cut-off on said article, introducing into said chamber a pressurized gas at a rate sufficient to maintain from said opening an outward flow such that the turbulent currents generated by said processing medium are prevented from entering said opening and chamber, positioning said article so that a predetermined part thereof in excess of the said selected body portion to be protected is recessed within said shielding member while said medium source scans the exposed end portion of said article, placing said medium source abreast of and preferentially below the defining edge of said shielding member and constricted opening thereat after the aforesaid end portion has been processed, and then raising said article out of said shielding member an additional distance sufficient to expose the recessed predetermined part of said article which is in excess of the said selected body portion and thereby effect said desired final line of cut-off.

3. The method of masking a selected body portion of an article from a stream of sprayed processing material and effecting a desired final line of cut-off which method comprises, inserting said article into an apertured shielding member adapted to loosely receive and contain the selected body portion of said article, positioning said article within said shielding member to define with the encircling edge thereof a relatively narrow opening and dispose a predetermined line of cut-off on said article in slightly recessed relation with respect to said edge, rotating said article and shielding member while so positioned, and, after the exposed end portion of said article has been sprayed, positioning the source of said sprayed material laterally of and preferentially below the encircling edge of said shielding member and aligning said predetermined line of cut-off on said article with the aforesaid edge and opening to effect said desired final line of cut-off.

4. The method of masking a selected body portion of an article from a stream of sprayed processing material and effecting a desired final line of cut-off which method comprises, inserting said article into an apertured shielding surface adapted to loosely receive the selected body portion of said article and define a predetermined line of cut-off on said article, positioning said article relative to said shielding surface so that a predetermined part of said article in excess of the said selected body portion to be masked is recessed, coating the exposed end portion of said article with said sprayed processing material, aiming the stream of sprayed material toward the exposed end of said article from a point below the said predetermined line of cut-off, and then producing relative movement between said article and shielding surface to expose to said sprayed material the recessed predetermined part of said article which is in excess of the selected body portion to be masked and thereby effect said desired final line of cut-off.

5. Apparatus for masking a selected body portion of an article from a sprayed processing medium comprising, a masking member adapted to loosely encircle said selected body portion of said article and having an opening adapted to expose the end portion of said article to be processed, the edge of said masking member at said opening being of such configuration as to define with the encircled part of said article a relatively narrow passage when said article is in its inserted position, means for providing a flow of gas through said passage to substantially prevent the influx of said processing medium into said passage, and means for producing relative movement between said article and masking member such that a predetermined line of cut-off on said article is first recessed with respect to the defining edge of said masking member and then disposed in coinciding relation therewith.

6. Apparatus for masking a selected body portion of an article from a sprayed processing medium comprising, an apertured shielding member dimensioned to loosely receive a part of said article in excess of the aforesaid selected body portion to be protected and contoured to define therewith a chamber with an opening to the atmosphere and normally accessible to said processing medium, means for accurately positioning said article within said shielding member so that the opening defined by said article and shielding member coincides with a predetermined final line of cut-off on said article, and means for producing relative movement between said article and said shielding member and a resultant displacement thereof sufficient to align the aforesaid final line of cut-off on said article with said opening from a normally recessed position.

7. Apparatus for masking a selected body portion of a

cylindrical article from a sprayed processing medium comprising a centrally-apertured shielding member dimensioned to loosely receive a part of said article in excess of the aforesaid selected body portion to be protected and contoured to define therewith a chamber with a constricted opening to the atmosphere and normally accessible to said processing medium, means for supporting said article within said shielding member so that the constricted opening thus defined is normally disposed a predetermined distance beyond a preselected line of cut-off on said article toward the exposed end thereof, and means for raising the article said predetermined distance out of said shielding member to bring the aforesaid preselected line of cut-off on said article into coinciding relation with said constricted opening.

8. Apparatus for masking a selected body portion of a cylindrically hollow article such as a tubular lamp bulb from a stream of sprayed particles comprising a centrally-apertured shield of cylindrical configuration dimensioned to loosely contain a part of said article in excess of the body portion to be protected and contoured to define therewith a chamber with a constricted opening to the

atmosphere and normally accessible to said processing medium, means for supporting said article within said shield so that the constricted opening thus defined normally encircles said article at a point spaced a predetermined distance beyond a preselected line of cut-off on said article and closer to the exposed end thereof, means for introducing a pressurized gas into said chamber and maintaining a controlled flow of gas through said opening, and means for raising said article said predetermined distance out of said shield and disposing the preselected line of cut-off on said article in coinciding relation with said constricted opening.

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