United States Patent [19]

Lewicki, Jr.

[11] **3,828,725**

[45] **Aug. 13, 1974**

[54] **CURTAIN COATER WITH RESTRICTED FLOW**

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[73] Assignee: **Armstrong Cork Company**, Lancaster, Pa.

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[21] Appl. No.: **76,427**

[52] **U.S. Cl.** **118/324**, 118/DIG. 4

[51] **Int. Cl.** **B05c 5/00**

[58] **Field of Search** 53/140; 117/105.3; 118/DIG. 4, 324, 325

[56] **References Cited**

UNITED STATES PATENTS

3,365,325 1/1968 Fraenkel et al. 118/324

FOREIGN PATENTS OR APPLICATIONS

601,546 6/1960 Canada 118/325

Primary Examiner—Henry S. Jaudon

[57] **ABSTRACT**

Curtain coaters are utilized to provide a curtain of coating material through which an object to be coated passes. The coater head cavity herein is provided with means to restrict the flow of material from the curtain coater and thereby prevent the flooding of a slow moving article which is meant to be coated with a controlled, relatively thin layer of material. The means restricting the flow may be an open-celled material or a group of nested spheres.

3 Claims, 5 Drawing Figures

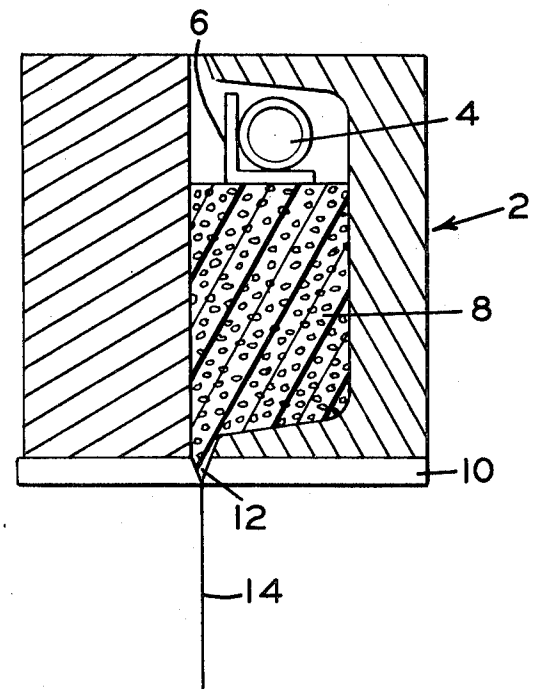


Fig. I

PRIOR ART

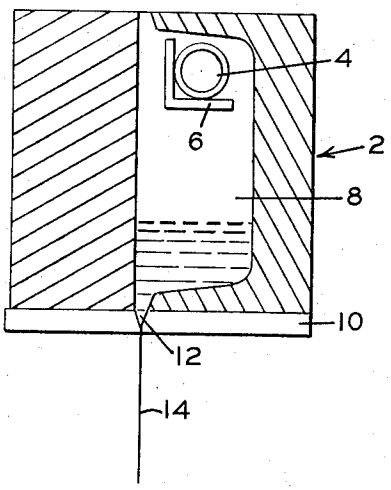


Fig. II

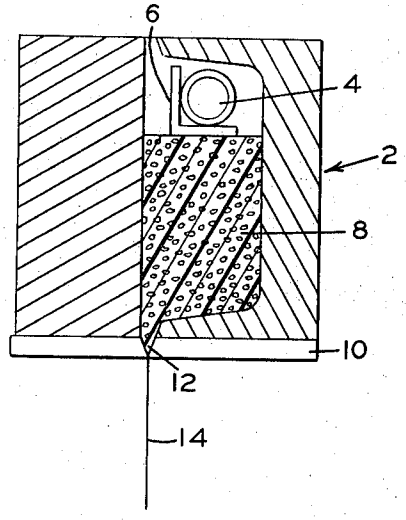


Fig. III

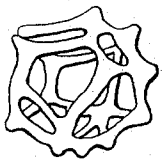


Fig. V

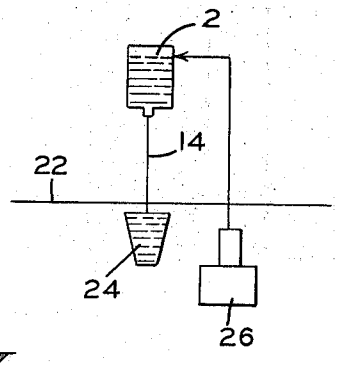
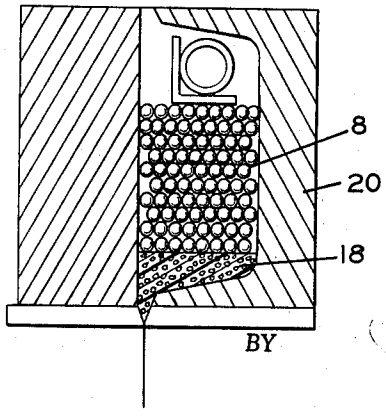


Fig. IV



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CURTAIN COATER WITH RESTRICTED FLOW

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention herein is directed to a coater and, more particularly, to a coater which is used to create a continuous uniform falling curtain of liquid to a slowly moving substrate.

2. Description of the Prior Art

Curtain coating structures have existed for a number of years. U.S. Pat. No. 3,365,325 shows a curtain coater which uses the foam material as the lip of the coater. This foam lip in conjunction with other elements is used to control the flow of liquid forming the curtain. It is believed that this curtain coater, as with most conventional curtain coaters, provides a curtain of liquid which will lay a thin coating of material on a moving substrate only when the substrate is moving in excess of 100 feet per minute. Certain manufacturing processes do not lend themselves readily to speeds this high.

Foam materials having an open-called structure exist in the art. An open-cell reticulated polyurethane foam is shown in U.S. Pat. No. 3,171,820, and an open-cell polyvinyl foam is shown in U.S. Pat. No. 3,352,802. These are general-purpose commercially available foam materials.

It has been the general practice within the art to attempt to control the flow of coating material forming the curtain by the use of restrictive lip structures or by control of the material volume being moved. It is an object herein to permit the utilization of conventional commercially available coaters and yet secure the ability to provide thin coatings to substrates with low speed of movement.

SUMMARY OF THE INVENTION

The invention relates to an apparatus for applying a thin and uniform coating to a moving surface by means of a modified curtain coating apparatus which permits the substrate to move at a speed considerably slower than the speed needed for conventional curtain coaters. This coating at slow speed is accomplished by the reducing of the amount of fluid head in the coater and restricting the downward flow of coating material within the curtain forming head of the coater. The above is accomplished by one of two techniques. The first technique involves the placing of an open-cell foam material in the cavity of the coater head. The foam material occupies a portion of the cavity of the coating head and thus reduces the amount of fluid head. Also, the cell structure tends to restrict the flow of coating material; therefore, less coating will flow from the coating head. The same result is secured by the use of spheres of material tightly packed within the coater head cavity. At the bottom of the nested arrangement of spheres, there is placed a very thin layer of an open-cell foam material. Both of the above techniques permit the use of a conventional coating head structure in such a manner as to permit the placing of a thin coating of material on a very slowly moving substrate.

BRIEF DESCRIPTION OF THE DRAWING

FIG. I is a showing of the prior art coating head structure;

FIG. II is a showing of the coating head structure with the open-cell foam structure;

FIG. III is an enlarged cross-sectional view of the foam structure;

FIG. IV is a view of a coating head with the combination sphere and foam structure; and

FIG. V is the showing schematically of a web coating structure.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The prior art coater head **2** has the material fed into the head by an input opening **4.** Positioned by the opening **4** is a distribution channel **6** which extends along the cavity **8** of the coating head. This distribution channel spreads the coating material across the full length of the cavity **8.** The cavity **8** is as long as the coating curtain to be formed. The coating material leaves the cavity **8** through a lip structure **10** which has a slot **12.** As the material leaves the slot **12,** it forms the curtain **14.** It is the curtain **14** of the coating material which the moving substrate passes through to receive its coating.

Normally, the above prior art coating head will provide a thin coating of material to a moving substrate only when the substrate is moving in excess of 100 feet per minute. Other processing procedures on the moving substrate may require the substrate to be moving at speeds substantially less than 100 feet per minute. Specifically, in trying to apply a 0.007 inch thick wet coating of polyurethane to a floor product moving at 50 feet per minute, the prior art structure is incapable of providing the coating of the required thinness. The slow speed is required because of other processing steps on the floor product. The following two techniques were found to be desirable to use so that a thin coating could be provided on a slowly moving substrate. Referring now to FIG. II, there is shown one technique of permitting the curtain **14** to provide a thin coating to a slow moving substrate. The conventional coating head **2** has the conventional material inlet **4,** distribution channel **6,** cavity **8** and slot **12.** The modification involves placing in the cavity **8** an open-celled material having about 60 pores per inch. The materials used may be an open-celled reticulated polyurethane foam, such as that shown in U.S. Pat. No. 3,171,820, or an open-celled polyvinyl foam, such as that shown in U.s. Pat. No. 3,352,802. FIG. III is a showing of an enlarged cross-sectional view of a typical foam-type material. This foam material occupies a certain portion of the cavity and, therefore, reduces the amount of fluid which would be held in the cavity. Also, the structure of the foam is such that it will restrict the downward flow of coating material from the distribution channel **6** to the slot **12.** The reduced flow means that less material will flow out of the coating head to form the curtain **14.** Therefore, a thin continuous coating is provided for placing a thin coating on a slowly moving substrate. The prior art structures were incapable of doing this because, when the curtain thickness was reduced to that which was necessary to provide the thin coating, the continuous coating curtain would break and improper coating would be secured on the substrate.

Referring now to FIG. IV, there is shown a modification of the structure of FIG. II. Here the foam material **16** of FIG. II has been replaced by a combination thin layer of foam material **18** and a plurality of ¾ inch di-

ameter nylon spheres or like inert spheres which are carefully stacked together in a nested relationship. The spheres **20** in effect form a structure which is very similar to that of an open-celled foam. This structure provides the same results as that shown in FIG. II.

Referring now to FIG. V, there is shown the general schematic layout of a coating operation. The substrate **22** to be coated moves through the curtain **14** which is formed by the coater head **2.** Excess material drops into a return trough **24** and is moved by a pump **26** back up to the coater head **2.** This apparatus will form a continuous thin curtain of coating material through which the substrate moves.

What is claimed is:

1. Apparatus for creating a uniformly thin, continuous curtain of liquid comprising a substantially elongated coating head structure having a cavity in which liquid is contained, at the bottom of the head structure there is provided an elongated slot which communicates with the cavity within the head structure, the improvement comprising reticulated open-celled foam material completely within the cavity of the coating head to occupy a portion of the cavity and to reduce the amount of fluid within the cavity and to restrict the downward flow of liquid through the cavity towards the slot.

2. Apparatus for creating a uniformly thin, continuous curtain of liquid comprising a substantially elongated coating head structure having a cavity in which liquid is contained, at the bottom of the head structure there is provided an elongated slot which communicates with the cavity within the head structure, the improvement comprising a plurality of spheres completely within the cavity of the coating head to occupy a portion of the cavity and to reduce the amount of fluid within the cavity and to restrict the downward flow of liquid through the cavity towards the slot.

3. The apparatus of claim **2** wherein the spheres are combined with a layer of open-celled foam positioned beneath a nested arrangement of spheres.

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