

1

2,811,106

## METHOD OF PRINTING POLYETHYLENE FOR BULK PACKAGING

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1 Claim. (Cl. 101—426)

This invention relates to a method for printing on the surface of polyethylene type plastic containers; particularly for the bulk packaging of pharmaceuticals.

In the packaging of pharmaceutical items, it is desirable to be able to package large numbers of capsules, tablets, or pills for shipment to hospitals or other major dispensing centers, so that the items may be economically transported and sold. With a group of such items as capsules or tablets, the pressure on the bottom of a container, or accidental jarring, or mistreating of the shipping containers, frequently results in the breakage of individual capsules or tablets, and the broken material dusts over the surface of the remaining capsules or tablets so as to cause them to become dirty. It is also desirable that the capsules or tablets be cushioned so far as possible, to prevent breakage. It is desirable that there be identification marking on subcontainers. It is also desirable that aid be given to the purchaser of the bulk container in counting.

These problems and others can all be solved by packing a representative number, for example, 100 capsules or tablets, in individual containers and then shipping the individual containers in a bulk package. For purposes of convenience and to reduce the size, it is convenient to use flexible, small containers. Whereas all of these advantages would appear obvious at first impression, it has been impossible to utilize them because of the difficulties of marking such packages and getting a satisfactory final container. Polyethylene, for example, of 4 mil stock, can be used to form very convenient packages and when packed with 100 tablets or capsules and sealed, the final package is moisture-resistant, adds greatly to the ruggedness of treatment which the items will stand, prevents dusting and contamination so that if one capsule is broken only those immediately adjacent are contaminated, adds a cushioning effect as the air trapped in between the layers adds tremendously to the cushioning action, and if a representative number, say 100, are present in each package, provides for subsequent counting from the larger containers to the final consumer. For all of these purposes it is necessary that the number and contents be indicated on the package. In the past it has been considered difficult to impossible to print on polyethylene bags.

For flexibility in operations, it is desirable that the individual bags be made up, and the bags printed at the time of use, in such size lots as may be then indicated. Attempts have been made to print on polyethylene rolls in sheet form, but such methods as have been more or less successfully used on such rolls are not flexible enough for bag printing, particularly in small variable bag lots.

There has now been discovered a method of printing on polyethylene bags for the packaging of such capsules and tablets, which, for the first time, renders possible the advantages desired because the marking on the package is sufficiently stable to stand up during shipment and provide a convenient and easy method of identifying the items both as to number, lot number, contents, source, and

2

other essential details, including at times a complex pharmaceutical formulation.

In testing such packages it is frequently convenient to use a piece of pressure-sensitive tape such as is known as "Scotch tape" for testing the printing. If the printing has dried and is ready for use, a piece of the pressure-sensitive "Scotch tape" is applied to the face of the package and immediately pulled off without removing the printing on the package. If the printing on the package is also flexible enough to stand flexing of the package, then the printing is in fact satisfactory. As simple as these criteria may seem, it has been extremely difficult and expensive or impossible to achieve a result which would be satisfactory.

In the past there has been a tendency to attempt to use heat to set the printing on the surface of the polyethylene. This has frequently been done on continuous rolls, as for example, shown in U. S. Patent 2,704,382, Kreidl, "Method for Printing on the Surface of Polyethylene Plastics."

It has now been found that by printing with an ordinary letter press using a soft type, as for example, rubber type, it is possible to print on polyethylene, and by heating the printed surface to between about 74° C. and 95° C. for not less than 10 seconds, and then chilling that surface to less than about -30° C. for not less than 15 seconds, the ink is caused to stick and is chilled and set so that the marked bags may then be stacked and utilized for packing. It is usually preferable to let them wait at least 12 hours before use. When so treated the bags are marked in such a fashion that they will pass the above "Scotch tape" test and will stand up under shipment.

The inks which are used with this process may be those such as are disclosed by Kreidl or known for the printing on the surface of polyethylene plastics.

One which is particularly satisfactory is compounded by mixing together 5 parts of a yellow ink such as "Multi-graph" yellow ink number 80 or "Superior" yellow ink, and 2¼ parts of a lacquer such as "Erco," water white lacquer, which is about a 12½% solution of nitrocellulose in a 30:70 solvent mixture of ethyl alcohol and butyl acetate together with plasticizers for the nitrocellulose.

4 mil stock polyethylene film was formed into bags approximately 4 by 6 inches. These were printed on a letter press using rubber type with the above inks, and as soon as printed, without touching the printed surface to avoid smearing, were run through a tunnel wherein a bank of infra-red lamps, with their heat rays focused as much as possible on the printed portions, heated the temperature of the air so the printed surface was heated to approximately 80° C. The bags were exposed to this temperature for approximately 15 seconds. They should be heated for at least 10 seconds and appreciably longer than 15 is not deleterious, although not necessary.

After the heat treatment, a draught of cold air, which had been passed over solid carbon dioxide, was passed over the printed surface of the bags so as to chill the surface to less than -30° C. Electric fans were used to blow cold air over the surface of Dry Ice and into contact with the printed bags. The exposure to the chilled air should be at least 15 seconds, although the upper limit is in no way critical. A time of over 30 seconds is economically unnecessary and has no particular advantages. The bags were then stacked and the next working day were filled with soft gelatin capsules and sealed.

As so packed the bags were placed into fiber containers, 500 such packages being placed in a single fiber container and shipped in commerce. The breakage of the capsules was markedly reduced over that to be expected in the use of the fiber containers alone, and the items were much more conveniently counted and handled and inventoried than had been previously possible. No diffi-

culty was experienced with offsetting or smearing or illegibility of the printed data on the bags.

I claim:

A method of printing on moisture resistant polyethylene sheet so the printed areas are resistant to pulling off and smearing which comprises printing on polyethylene sheet with a plastic printing ink with resilient type on a letter press, heating the printed surface to at least about 74° C. for not less than 10 seconds, then chilling the printed surface to less than about -30° C. for not less than 15

seconds, and slowly warming the polyethylene sheet to room temperature.

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