METHOD AND APPARATUS FOR PACKAGING SOLID OR SEMISOLID MATERIAL

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8 Claims

ABSTRACT OF THE DISCLOSURE

A method for packaging normally solid or semisolid material which comprises liquefying the said material and feeding it in a liquid state to a container, said filling process being performed while the portion of the container being filled is substantially surrounded, supported and cooled by a liquid, and while cooling means are also being applied to the portion of the container which is above the surface of said liquid.

Apparatus for carrying out said method.

This invention relates to improvements in packaging. The invention is particularly applicable to the packaging of normally solid, or semi-solid materials that are capable of being rendered fluid by heating such as, for example, asphalt, paraffin wax or sulphur.

In the invention material to be packaged is liquefied by heating and fed in a liquid state, to a container, preferably in the form of a sheath, formed of an appropriate packaging material, filling being performed whilst that portion of the sheath being filled is substantially surrounded, and cooled, by a liquid, generally water, contained, for example, in a tank, filled portions of the sheath being divided by appropriately sized apparatus which squeezes and cuts the sheath to form packages of filler material, the packages eventually sinking in the liquid, preferably to conveyor or other lifting apparatus which transfer them from the tank containing the water or other liquid to storage.

The packaging material requires to be substantially imperious to the water or other cooling liquid in the tank and not to melt at the temperature at which the heated filling material is packaged. Preferably the packaging material is one that may be incorporated, in use, with the filler material, without detriment thereto, so that the complete package may be used without removal of its contents. Suitable materials, in general, are plastics such as polyethylene, propylene, polyvinyl chloride, poly-styrene and cellophane. In particularly preferred forms of the invention the material to be packaged, and the packaging material are so selected that the filler material seals, or helps to seal, the package thus obviating the necessity to employ expensive sealing equipment. When asphalt is the filler material the preferred packaging material is polyethylene. It has been found, however, when packaging certain materials, such as asphalt packaged in polyethylene, that there is a tendency for part of the packaging material above the cooling tank to be melted by hot filling material before the filler package reaches the cooling liquid in the tank and, to prevent this, means are provided to cool the packaging material as the vulnerable position above the cooling liquid in the tank. Examples of such means are a water spray, or a draught of air, directed on to the exterior of the packaging material. This cooling also serves to provide a static material pressure counteracting the hydraulic liquid pressure in the tank.

The liquid in the tank not only removes heat from the filler material but also serves as a supporting medium for the package thus permitting thinner filler material than would otherwise be possible to be used without bursting under load. The cooling liquid preferably is selected to have a density intermediate that of the filler material in its liquid and solid states so that the packages float until their contents solidify and then sink in the cooling liquid. This ensures that during much of the time that the package is cooling in the bath, the bursting stress on the packaging material is reduced.

The containers are suitably formed by continuously assembling sheathing, for example from rolls and forming the sheets firstly into a sheath. The sheath may be formed in various ways; for example, plastics may be fed from rolls and their edges welded together a single sheet may be used and its two edges welded together. The sheet of plastics is unrolled and fed along the line of injection of the filler material being formed into a sheath before reaching the position of injection. Instead of welding strips of plastics to form the sheath, plastics material may be formed into a sheath by direct extrusion blowing. In this case the asphalt injection line can pass through the centre of the extrusion profile and injection can be performed at a distance from the extrusion outlet where the mechanical characteristics of the sheath are sufficient for filling in the cooling liquid in the tank; it is still necessary, in this case, to provide for cooling of the sheath above the surface of the cooling liquid in the tank. In preferred forms of the invention, as previously mentioned, the materials to be packaged are liquidifiable or softenable, by heat and, when packaged, sink as they cool in the surrounding liquid to the carrying or transporting equipment.

The invention is particularly applicable to the packaging of cold-setting liquids, such as asphalts, having mechanical characteristics that prevent handling and packaging of the package at normal storage temperature without considerable deformation. It is convenient to supply the materials by pumping, if possible, and thus, in general, the most suitable materials for packaging according to the method of the invention are those with a setting point above, say, about 50 °C, and which are pumpable at higher temperatures, e.g. blown asphalt which may be pumped at about 150 °C. Any filling temperatures which will not cause melting of the container under the conditions of the filling method of the invention may be used but, in order to limit the cooling period in the tank, it is desirable to keep the temperature as low as possible.

The method of the invention, by filling and cooling in liquid, ensures that no mechanical forces are applied to the sheath during filling and setting of the filled material. Moreover, in certain cases, e.g. the packaging of asphalt, the packages remain together first filled and sink when they are cooled. In this way the cooled packages become easily removable from the water tank. Although water has been specifically referred to as the cooling liquid, other cooling liquids may be employed, the cooling liquid preferably being selected to achieve floating of the packaged material until it becomes the invention.

The invention is further illustrated, by way of example, in the accompanying drawing.

As shown in the drawing material to be packaged, e.g. heated bitumen asphalt, is recirculated through a recirculation line and drawn off for packaging through a line 2 provided with a quick closing valve 3. Rolls 4, of sheathing material 5, e.g. polyethylene, are unrolled in the path of line 2 and joined e.g. by high frequency electrical equipment, at 6. Material from line 2 fills into the sheath formed by joining the sheet 5, and passes downwards to a tank 7 containing liquid, e.g. water 8. The filled sheaths 9 are closed and separated as shown at 10 by appropriate
squeezing and cutting means and, preferably, float as shown at 9e, until they cool and sink, as shown at 9b, to a belt conveyor lifting system 11 which transfers them from the tank 7 to storage. There is preferably provided a water spray 12, suitably of circular form, which enables a cooled material level to be provided inside the sheath a small distance above the water level and also to provide a static material 8 (e.g. asphalt) pressure countering the hydraulic liquid pressure in the tank. An air supply as shown at 13 is also suitably provided.

The bagging method of the invention permits the employment of packaging material that is compatible with the material to be packaged. As previously mentioned, the liquid in which the materials are packaged and the means provided above the surface of this liquid, act also as a cooling medium which protects the packaging material from melting even if the filling temperature of the material being filled is substantially in excess of the melting point of the packaging material; thus, when packaging asphalt into polyethylene sheathing filling temperatures as high as 210° C. may be employed without detriment to the polyethylene sheaths of melting point, in air, of 117° C.

The invention has been described particularly, with reference to continuous filling wherein sheaths are continuously formed and filled. Whilst this is preferred the invention is also applicable to non-continuous filling using preformed packaging sheaths.

What is claimed is:

1. The method of packaging normally solid or semi-solid material which comprises liquefying the said material by heating and feeding it in a liquid state to a container, filling being performed whilst that portion of the container being filled is substantially surrounded, supported and cooled, by a liquid, cooling means also being applied to the container at a position above the surface of the said liquid.

2. The method according to claim 1 wherein the said container is in the form of a continuous sheath filled portions of the sheath being divided by squeezing and cutting to form packages of filler material.

3. The method according to claim 2 wherein the said sheath is formed from sheet material being fed towards the filling position and joined at the edges to form the sheath said sheath being formed before the sheet material reaches the filling position.

4. The method according to claim 2 wherein the sheath is formed by extrusion blowing.

5. The method according to claims 1, 3 or 4 wherein the said cooling liquid has a density intermediate the density of the filler material in its liquid and solid states respectively.

6. The method according to claims 1, 2, 3 or 4 wherein the said normally solid or semi-solid material is asphalt.

7. The method according to claims 3 or 4 wherein said sheath is formed from polyethylene, polypropylene, polyvinyl chloride, polystyrene or cellophane.

8. Apparatus for packaging normally solid or semi-solid material comprising means for delivering sheet material, means for forming said sheet material into a sheath, means for delivering liquefied filling material to said sheath, means for delivering said sheath whilst being filled to a bath adapted to contain liquid, means to cool a portion of said sheath above liquid in the bath and means in said bath for squeezing and cutting portions of said sheath to form packages of filler material.

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