United States Patent [19]

Parker

[11] **3,837,778**

[45] **Sept. 24, 1974**

[54] **APPARATUS FOR PACKAGE MOLDING, ROOFING ASPHALT**

[76] Inventor: **Reid T. Parker,** 1347 S. Washington, Wichita, Kans. 67211

[22] Filed: **Dec. 22, 1972**

[21] Appl. No.: **317,533**

[52] **U.S. Cl.** **425/256,** 425/117, 425/261, 425/447, 425/449, 425/455, 53/122, 206/84

[51] **Int. Cl.** **B29c 5/00**

[58] **Field of Search** 425/256, 261, 447, 86, 425/455, 117, 449, 455; 53/122, 214, 302, 198, 61

[56] **References Cited**

UNITED STATES PATENTS

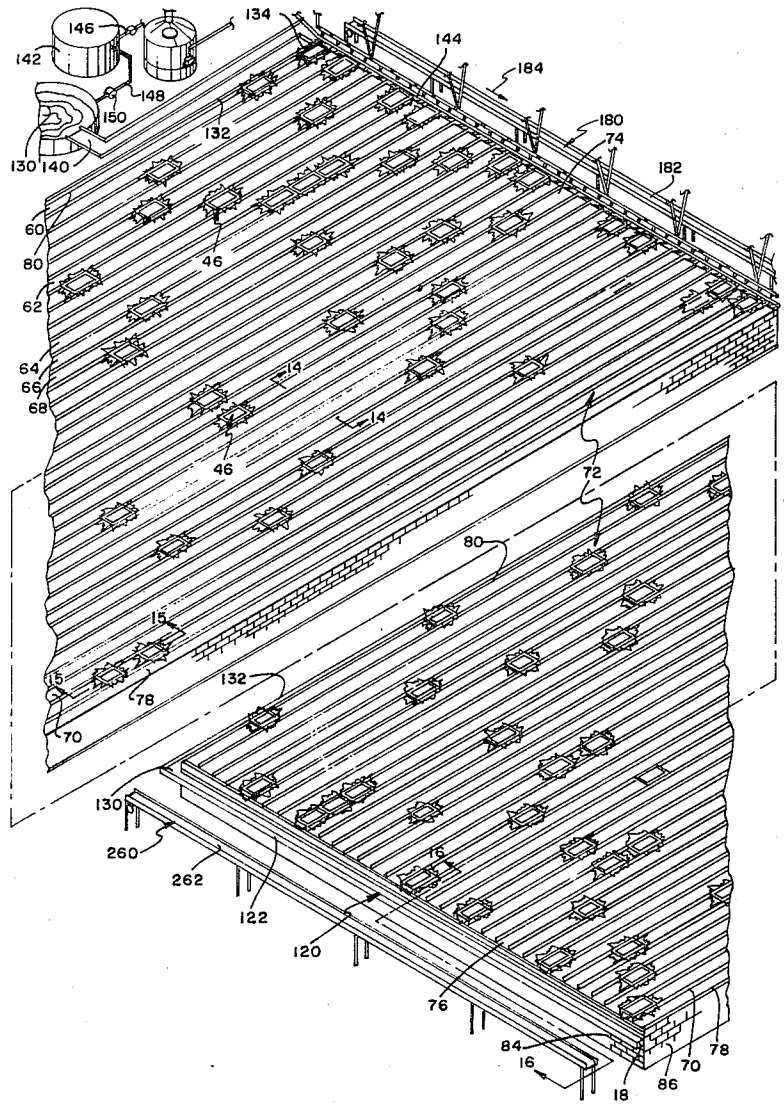
1,297,917	3/1919	Schmitt	425/261 X
2,167,392	7/1939	McDonald	425/86
2,664,592	1/1954	Ingraham et al.	425/447
3,166,025	1/1965	Hulse	425/447 X
3,528,143	9/1970	Beneke	425/261 X
3,680,991	8/1972	Cate et al.	425/86
3,763,661	10/1973	Betschart et al.	425/261 X

Primary Examiner—Robert L. Spicer, Jr.
Attorney, Agent, or Firm—Robert E. Breidenthal

[57] **ABSTRACT**

Roofing asphalt packaged in a film of polyester resin and the packaging method wherein hot asphalt is poured into a mold or boat that is lined by the polyester film at a charging station, such boat being floated on a stream of cooling water that carries the boat and its cooling contents to a discharge station whereat the cooled asphalt enveloped in the resin film is removed from the boat as the packaged product with the boat being returned to the charging station for reuse.

20 Claims, 20 Drawing Figures



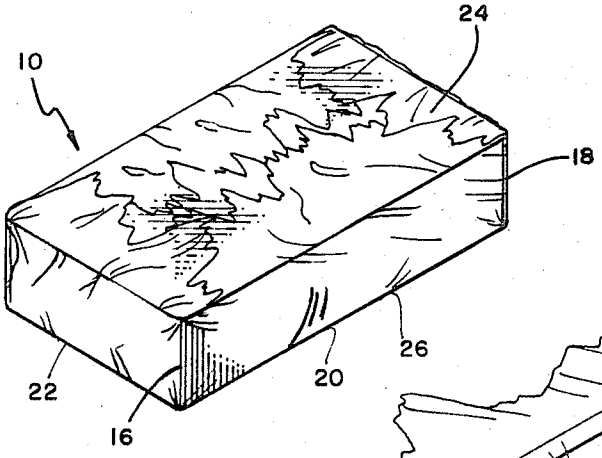


FIG. 1

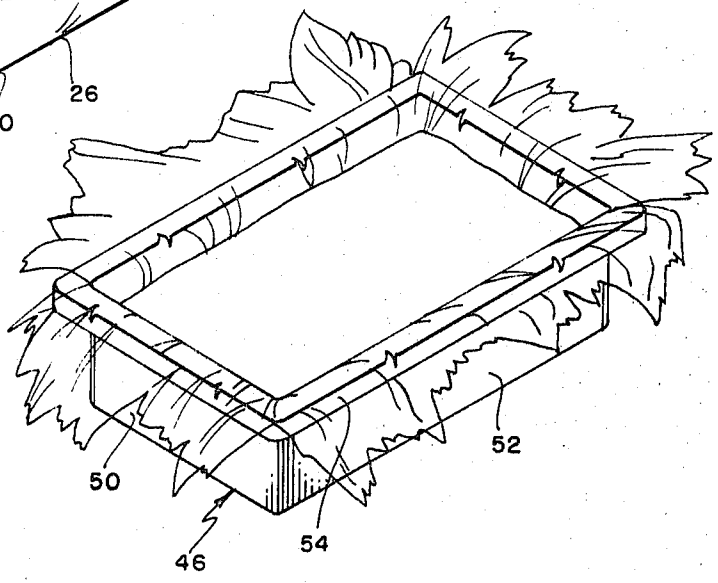


FIG. 2

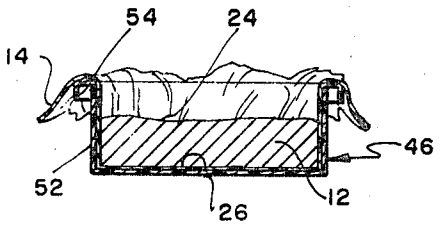


FIG. 3

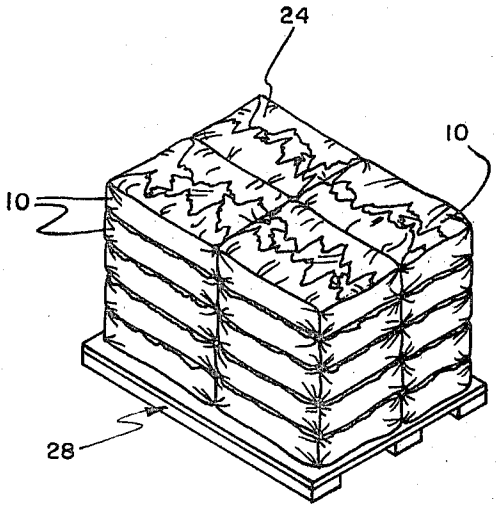


FIG. 4

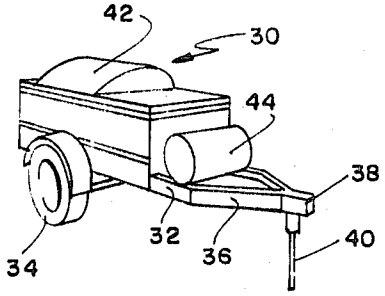


FIG. 5

FIG. 6

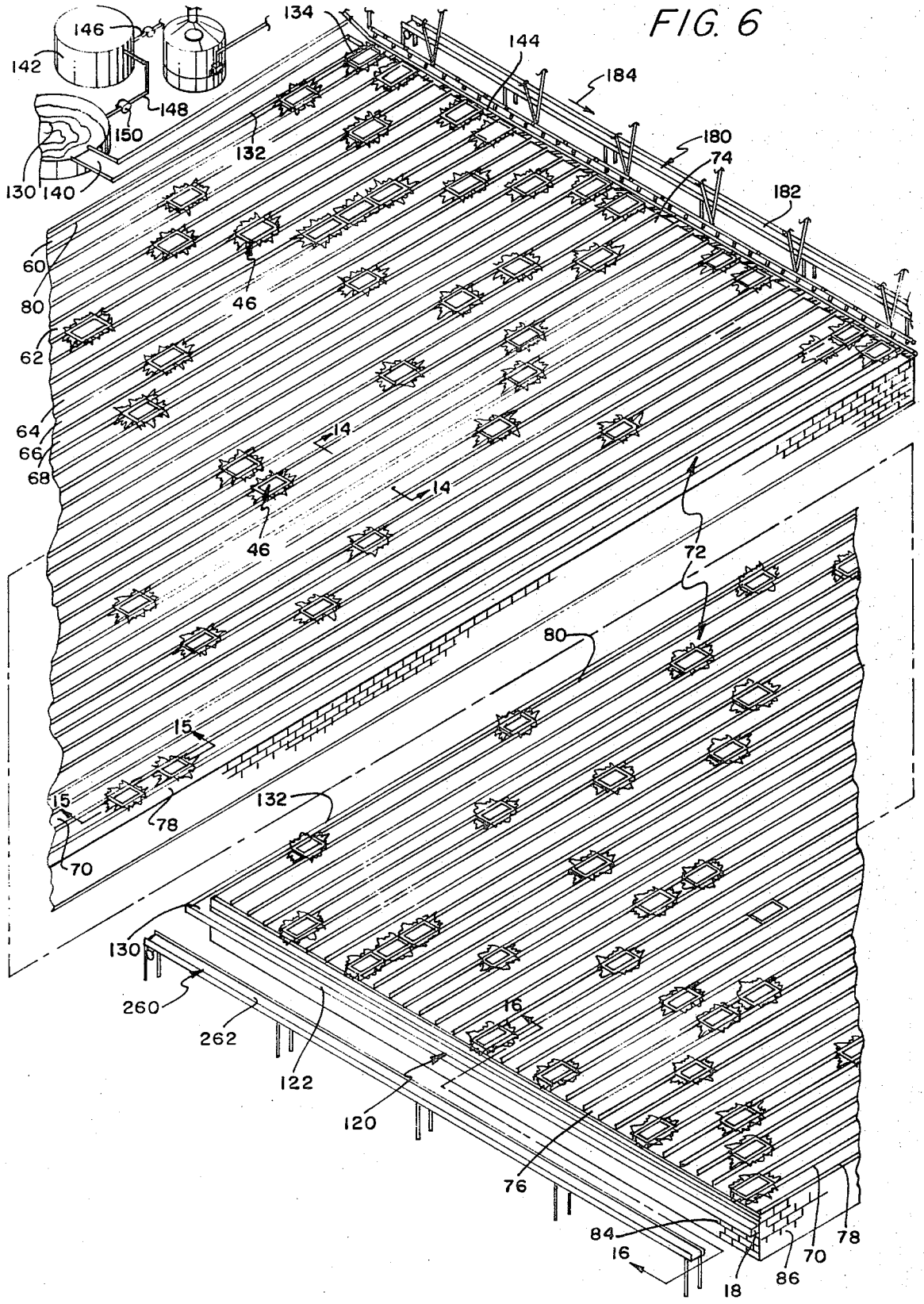
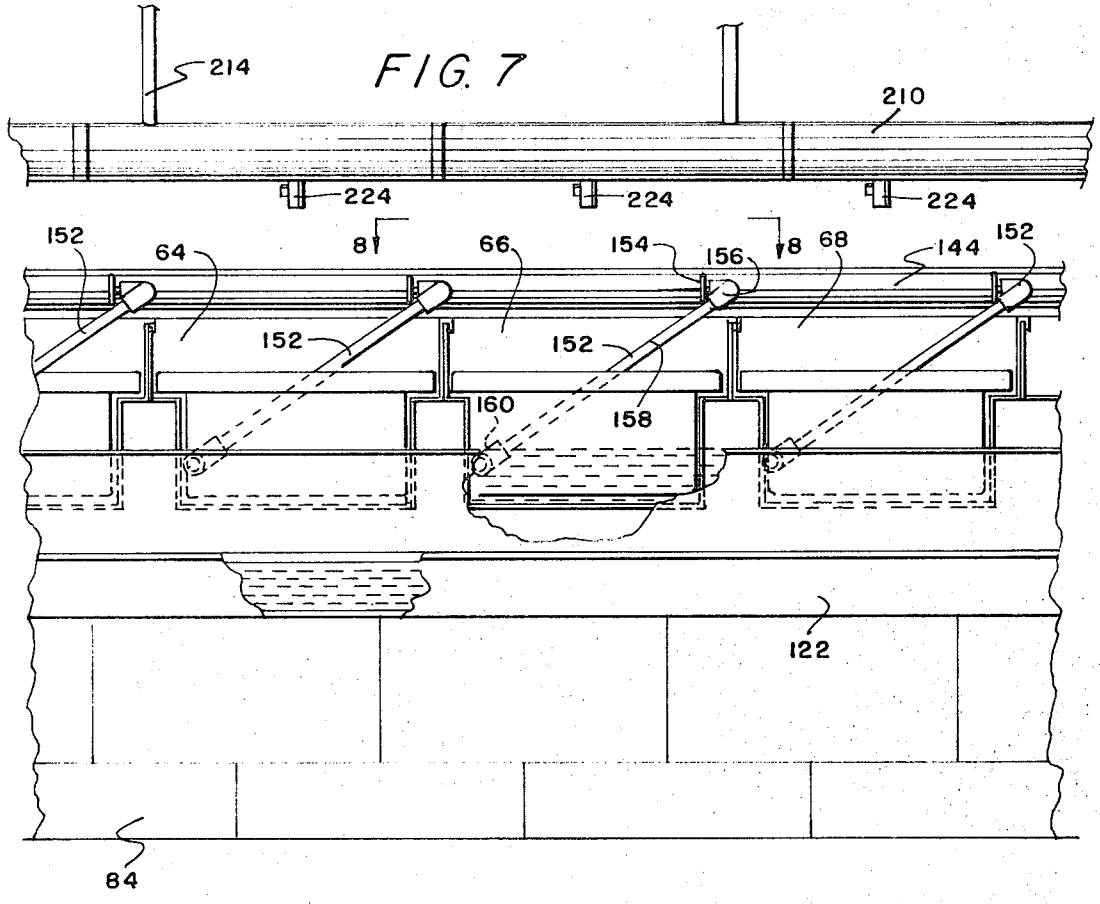

146
142
134
144
184
148
150
132
180
74
182
130
140
60
80
62
46
64
66
68
14
14
46
72
80
15
15
78
132
70
130
260
262
122
120
16
76
84
16
18
86
70
78

FIG. 7


214
210
224
224
224
152
64
81
66
154
156
68
144
152
152
152
160
158
122
84

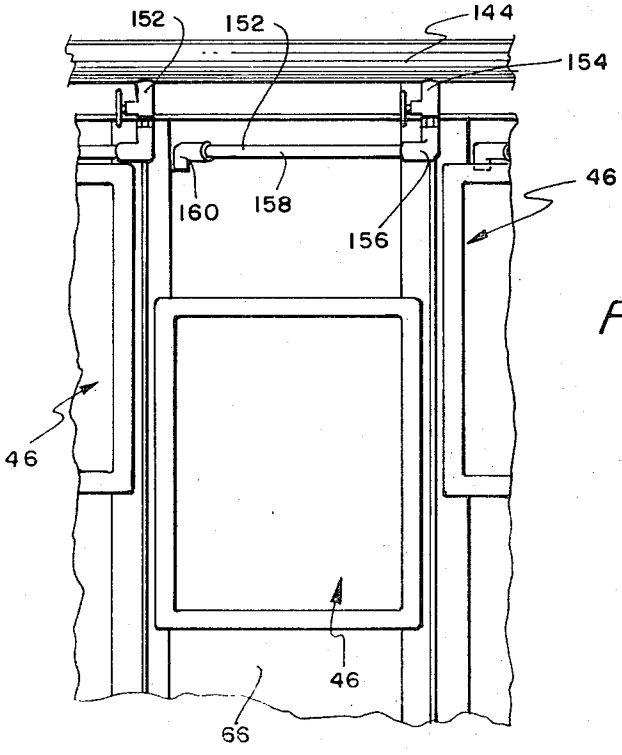

152
152
144
154
160
158
156
46
46
46
66

FIG. 8

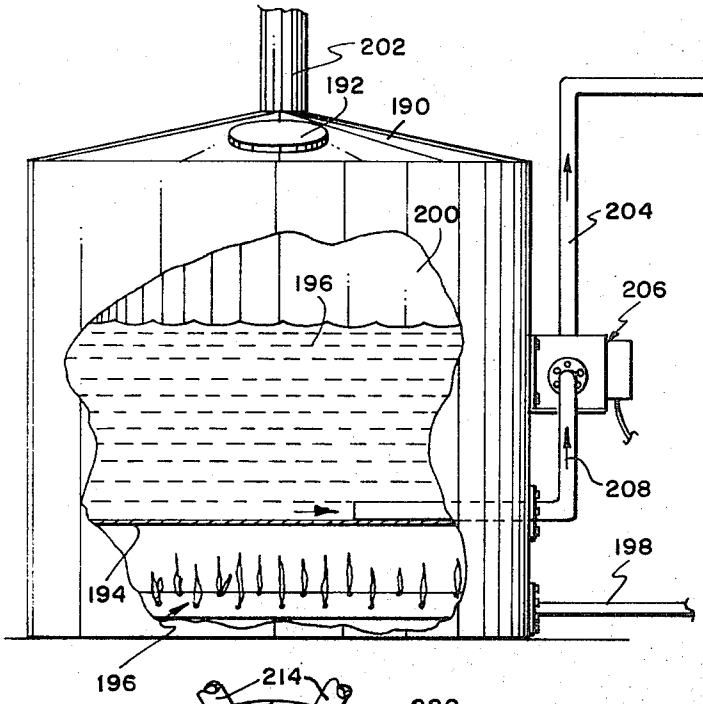


FIG. 9

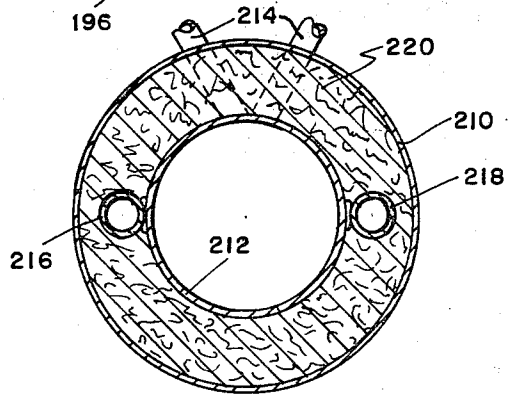


FIG. 11

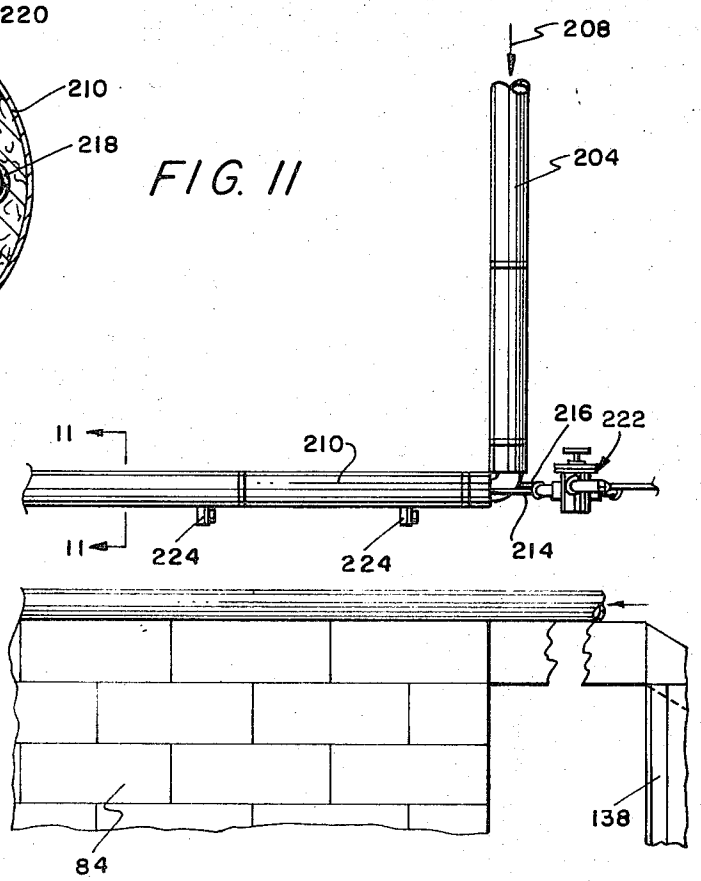


FIG. 10

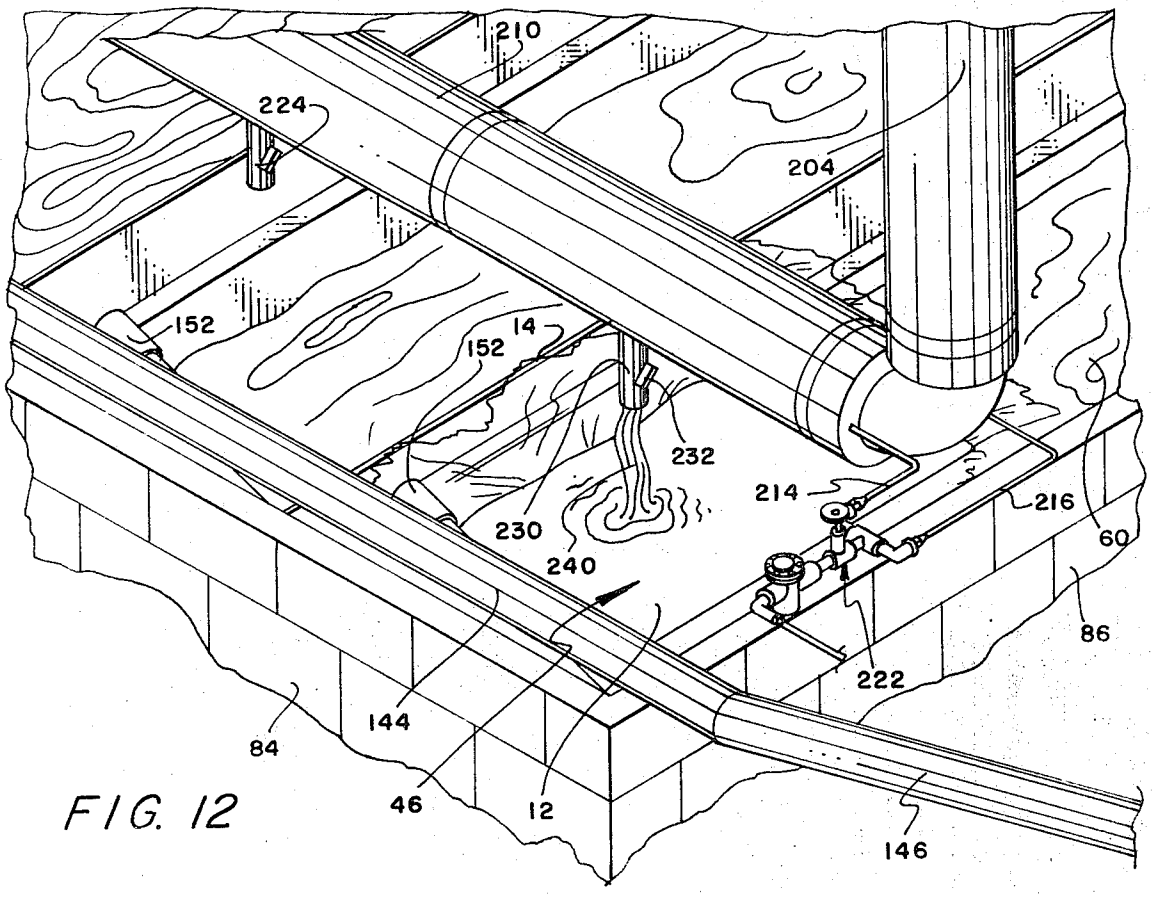

210
224
204
152
152
14
232
214
216
230
240
60
86
222
84
144
46
12
146

FIG. 12

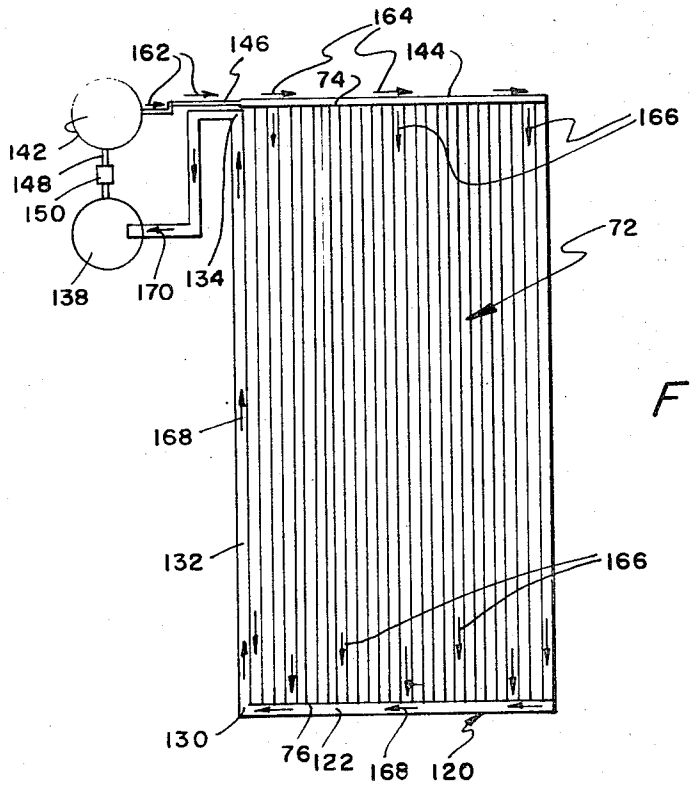

164
162
146
144
74
166
142
148
150
72
138
170
134
168
132
166
130
76
122
168
120

FIG. 13

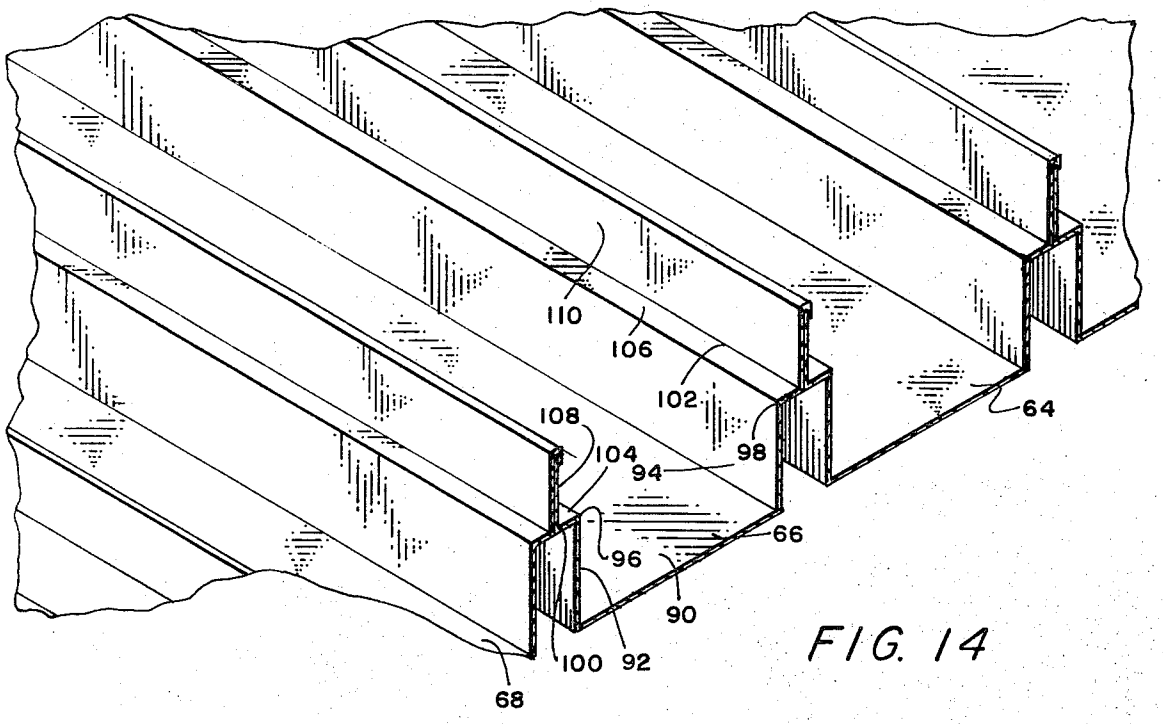

110
106
102
64
108
104
98
94
66
96
90
100
92
68

FIG. 14

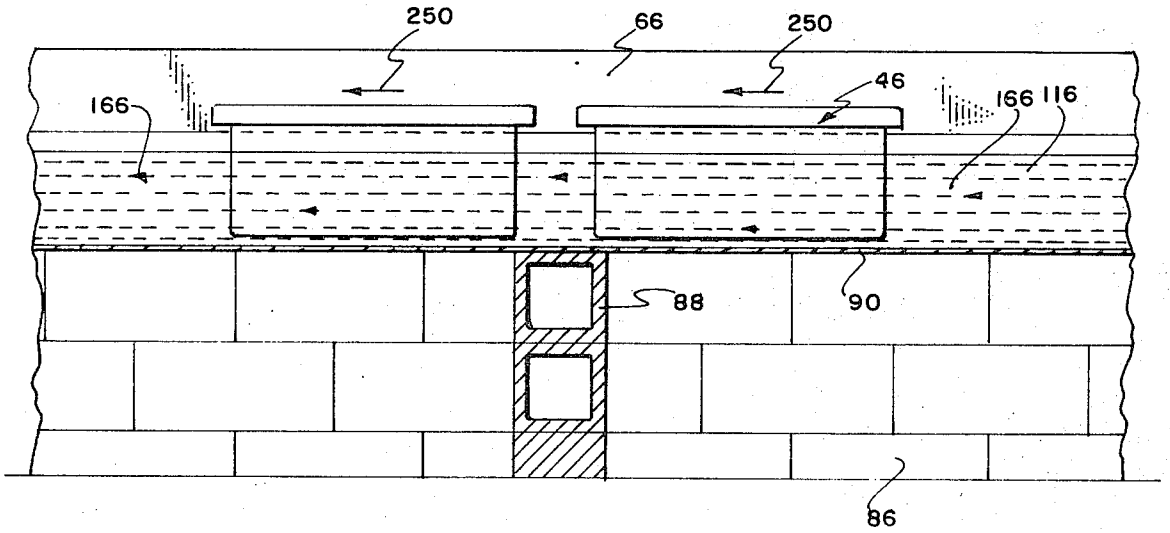

250
66
250
46
166
166
116
88
90
86

FIG. 15

FIG. 16

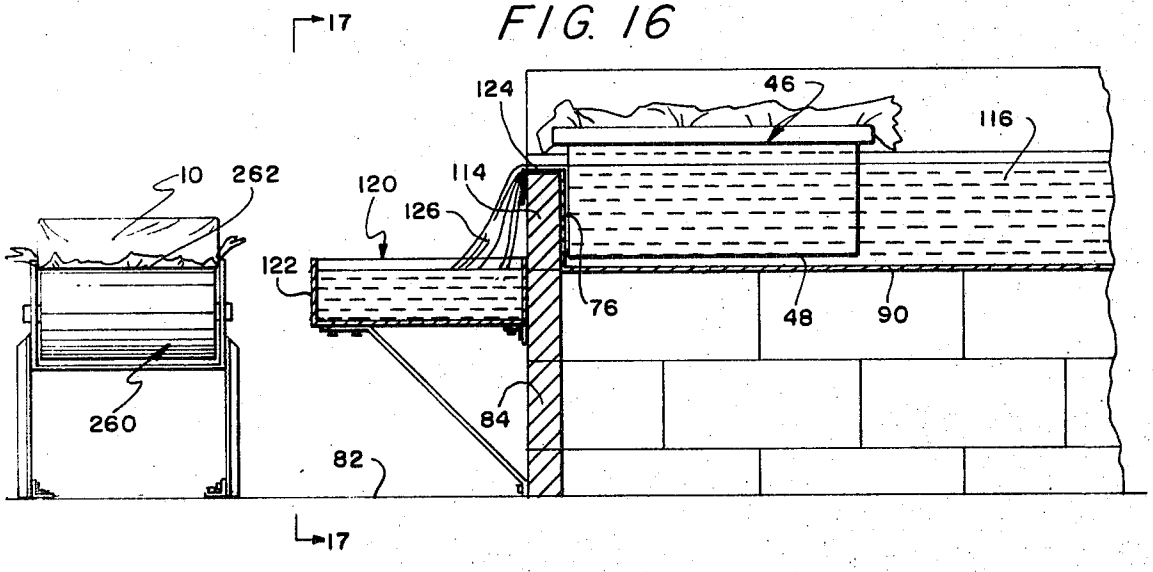


FIG. 17

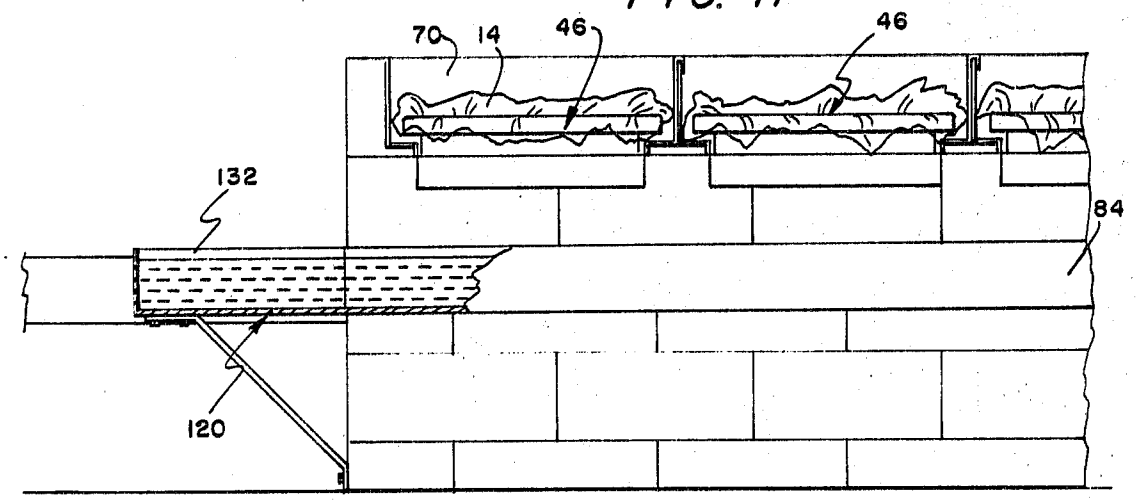
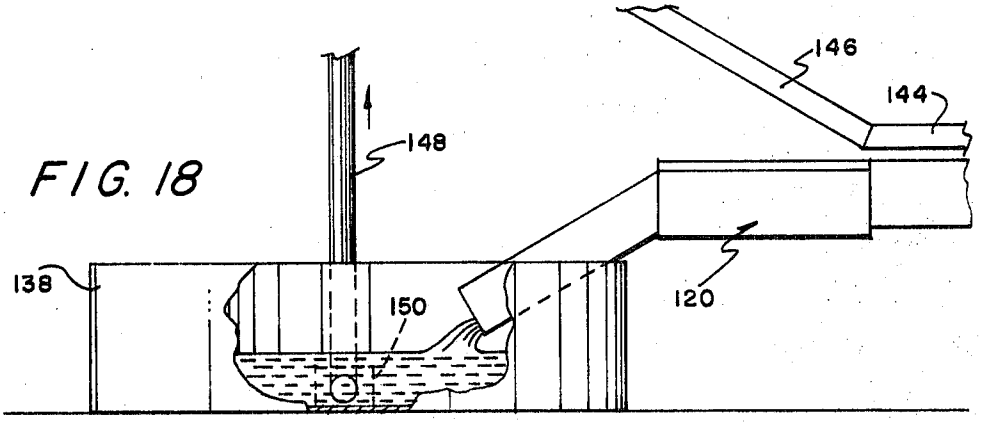


FIG. 18



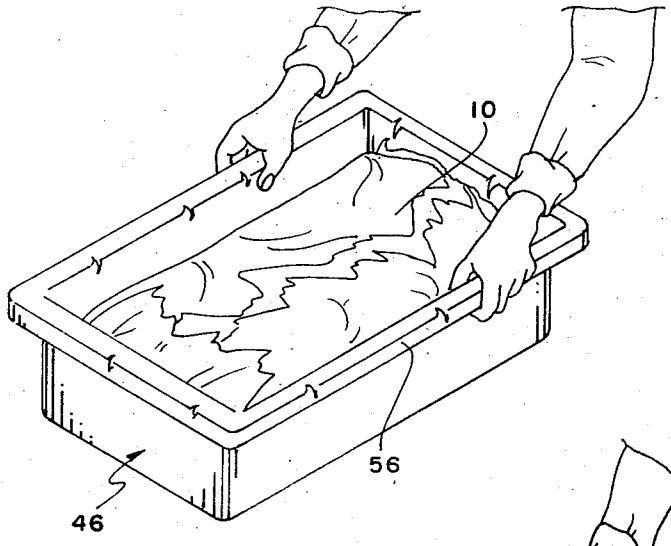


FIG. 19

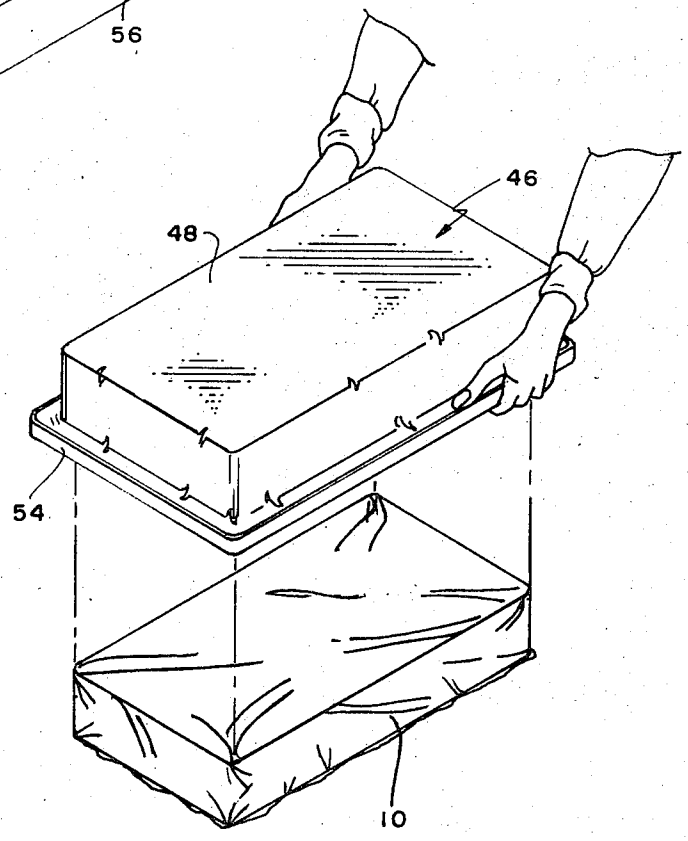


FIG. 20

APPARATUS FOR PACKAGE MOLDING, ROOFING ASPHALT

The present invention relates to new and useful improvements in packages and in new and useful improvements in methods of and apparatus for packaging materials, especially materials having cohesive or tacky characteristics and/or cold-flowing characteristics.

More particularly the invention pertains to an improved packaged roofing asphalt wherein the asphalt is enveloped in a film of thermoplastic resin such that the package is (1) of sufficient strength and toughness to maintain substantial dimensional integrity of package blocks of approximately rectangular configuration when stacked at temperatures such as normally prevail in where the same may be housed, or on transport vehicles, (2) of such surface character as to prevent contacting packages from sticking to each other as would make otherwise convenient manhandling extremely difficult if not impossible, and (3) the resin envelope will soften or disintegrate to such an extent as to be completely incorporated into the mass of the asphalt upon melting of the latter with no deleterious effect on the asphalt; this with no increase of fire hazard or formation of scum at the temperatures to which roofing asphalt is normally heated prior to application on a roof.

The invention also pertains to new and useful improvements in methods of cooling asphalt as it is molded into packaged form and moved to a location for expelling the enveloped and molded asphalt.

The invention also pertains to new and useful improvements in apparatus for packaging goods possessing some if not all the difficult handling and packaging characteristics as roofing asphalt, and especially for use in carrying out the improved packaging methods alluded to in the preceding paragraph.

Prior art suggestions for packaging materials possessive of at least some of the difficult properties of roofing asphalt are set forth in the following U.S. patents and the same can be referred to for a background understanding of the art:

U.S. Pat. No. 3,366,233, entitled Packaged Asphalt, issued to J. C. Roediger, Jan. 30, 1968, and discloses asphalt being packaged in a multilayered or laminated container or encasement of sheeting or film of poly alpha olefin having a melt index below about 12 (measured at 230° C.) and being composed of polyethylene, polypropylene or the plastic or plastomeric copolymer of ethylene and propylene. The sheeting or film ranges in thickness between about 2 and about 6 mils.

U.S. Pat. No. 2,639,808, entitled Packaging of Tacky Materials, issued to A. W. Barry et al., May 26, 1953, and discloses packaging tacky materials in a flexible, solid film of a non-tacky, compatible material and mentions films of such materials as polyethylene, ethylene/-vinyl acetate interpolymers including polyesobutylene, polyvinyl ethers, polyvinyl esters, chlorenated polyethylene, soft aerylate and methacrylate polymers, natural rubber, and synthetic rubber. Interestingly, this patent was assigned to E. I. du Pont de Nemours & Company which is a major manufacturer of polyesters such as used in the practice of the instant invention, namely, a polyester (polyethylene terephthalate resin) sold under the trademark MYLAR.

U.S. Pat. No. 2,762,504, issued Sept. 11, 1956 to W. J. Sparks et al., and discloses, as set forth in the title,

Packaging Tacky Hydrocarbon Polymers in Polyethylene Film.

Other U.S. patents such as the following further show the state of the art:

U.S. Pat. No. 2,287,849 entitled Antistick Surface Coating;

U.S. Pat. No. 2,572,959, entitled Packaging Tacky Isobutylene-Diolefin Rubber in Film of Compatible Styrene-Isobutylene Copolymer, which issued to W. J. Sparks on Oct. 30, 1951;

U.S. Pat. No. 3,216,566, entitled Stabilizer-Lubricant Aggregate, which issued to C. Rosenthal on Nov. 9, 1965.

A paramount object of the present invention is to envelope a mass of tacky and/or cold-flowing material such as roofing asphalt or the like in a film of non-tacky material that will substantially prevent cold flow and preclude enveloped masses of material sticking together, and which envelope film will soften, diffuse, disintegrate or readily mix into and not adversely affect the material upon heating the latter to a fluidity suitable for use.

Another paramount object is to provide a method that is suitable for enveloping roofing asphalt suitable for use on steep pitched roofs in a thin film of a thermoplastic resin that softens at a temperature substantially higher than that at which the roofing asphalt is normally poured in conventional packaging, and which method is simple, economical and can be practiced by persons with little special training without any need for complex or expensive machinery.

Another paramount object of the invention is to provide apparatus for practicing the method of the preceding paragraph, and wherein cooling of the hot poured material is effected by heat exchange with water that also serves to move the poured material.

The first major aspect of the invention involves the method of packaging a material having tacky and/or coldflowing characteristics, which comprises forming a pocket in a thin sheet of a thermoplastic resin having a melting point substantially higher than that of the material, softening said material to a flowable condition by heating the same, and flowing a quantity of the heated material into the pocket defined by the sheet of thermoplastic resin, such quantity being sufficient partially to fill the pocket, while exteriorly supporting and contacting the sheet of resin defining the pocket by a pocket forming member, and cooling the quantity of material in the pocket by withdrawing heat therefrom through the pocket defining sheet of resin and the pocket forming member.

The second major aspect of the invention involves, in packaging apparatus, the improvement comprising an elongated trough extending between charging and discharging stations adopted to contain water, a boat or boatlike mold disposed in said trough and adapted to float on water in the trough for movement between the stations, means at said charging station for depositing a quantity of the material to be packaged into the boat when the latter is at the charging station, and means for moving the boat along the trough to the discharging station.

The third major aspect of the invention is the package or product and is a roofing asphalt derived from the refining of petroleum and having a soft point in the range of about 170° F. to about 220° F. enveloped in a solid film of a polyester resin having a thickness less

than about two thousandths of an inch to constitute packaged roofing asphalt suitable for stacked storage and transportation.

Other objects, features, aspects and advantages of the invention will become apparent during the following description thereof, the same being given in conjunction with the accompanying drawings, wherein:

FIG. 1 is an isometric view of roofing asphalt packaged in accordance with the invention;

FIG. 2 is an isometric view of a boatlike mold lined with a film of a thermoplastic resin and in condition for the pouring of hot asphalt therein;

FIG. 3 is a transverse vertical sectional view on a reduced scale through the arrangement of FIG. 2 after hot asphalt has been poured thereinto;

FIG. 4 is an isometric view of packaged asphalt stacked on a cargo pallet;

FIG. 5 is an isometric view on a greatly reduced scale of a conventional combined asphalt heater and trailer of the type wherein packaged asphalt can be melted without envelope removal for roof application;

FIG. 6 is a broken isometric view of the trough array, the return trough, and includes a diagrammatic illustration of the water collecting and storage tanks;

FIG. 7 is a fragmentary elevational end view taken from the discharge or unloading end of the trough array with parts being broken away and other parts being shown in dashed outline to reveal hidden parts;

FIG. 8 is a fragmentary top plan view of the charging end of one of the troughs and is taken from the plane of the line 8—8 in FIG. 7;

FIG. 9 is an elevational view of the asphalt heating furnace with parts broken away;

FIG. 10 is a fragmentary end view of the trough supporting structure at the mold return location and the inlet end of heated asphalt supply manifold;

FIG. 11 is an enlarged transverse sectional view of the asphalt supply manifold;

FIG. 12 is an enlarged fragmentary view taken from about the same position as the view of FIG. 10, and shows the filling of a mold at the charging end of one of the troughs;

FIG. 13 is a schematic illustration of the water circulation and cooling arrangement;

FIG. 14 is an enlarged and fragmentary isometric view of troughs that are in section along the plane of the section line 14—14 in FIG. 6;

FIG. 15 is an enlarged vertical sectional view taken upon the plane of the section line 15—15 in FIG. 6, with a pair of molds being shown in solid outline;

FIG. 16 is an enlarged vertical section taken upon the plane of the broken section line 16—16 in FIG. 6;

FIG. 17 is a fragmentary elevational view taken upon the plane of the line 17—17 in FIG. 16, with parts of the L-shaped return trough being broken away;

FIG. 18 is an elevational view of the drain and settling tank with parts broken away, and shows the same in relation to the return trough and the feed and pump line to the water storage vessel;

FIG. 19 illustrates isometrically a manually grasped mold with enveloped asphalt therein; and,

FIG. 20 shows the enveloped asphalt dropped from a manually held inverted mold.

Referring now to the drawings wherein like numerals designate like parts throughout the various views, the reference numeral 10 designates a package of generally rectangularly shaped block of roofing asphalt 12 that is enveloped in a solid sheet or film of a polyester resin 14. For convenience in handling, storage, stacking, transport, and initial cooling in the desired shape, the package 10 weighs about 50 pounds, has a length and width respectively of 24 inches and 12 inches. A height of somewhat less than 6 inches, namely, about 5¼ inches yields a package weight of about 50 pounds. The length to width ratio of two to one makes stacking very simple, it being noted that a 24 by 24 inch configuration is obtained on two packages being laid side-by-side without regard to whether their major dimension is in one direction or at right angles thereto.

While the substantially vertical corners, such as those shown at 16 and 18, as well as the horizontal bottom side and end edges 20 and 22 are rounded somewhat, the top and bottom sides 24 and 26 of the package 10 are essentially flat and horizontally parallel so as to be conveniently stacked such as upon a pallet designated generally at 28 in FIG. 4 for transport by a fork lift truck or the like, not shown.

The asphalt contained or enveloped in the package 10 is essentially an asphaltic residue derived during the refining of petroleum and which is marketed as roofing asphalt.

The roofing asphalt 12 is of a relatively high softening point as compared to roofing asphalts suitable solely for use on dead flat roofs (that is, perfectly flat roofs or roofs sloping less than one-quarter inch per foot). The asphalt has a softening point preferably about 200° F. to 205° F. and the soft point can be in the range of about 170° F. to about 220° F. The asphalt 12 is a roofing asphalt suitable for use on pitched roofs.

Generally speaking, the roofing asphalts of this invention are such as to require heating to a temperature in excess of 240° F. and typically to about 275° F. to about 325° F. in order to possess sufficient fluidity to be readily piped and valved or to conduct the pouring done in packaging operations; this notwithstanding the fact that roofing asphalt suitable for pitched roofs has a softening or melting point in the range of about 170° F. to 220° F. As with materials of amorphous character the melting point is not sharply defined but is a temperature region called the softening or soft point at which the material appreciably loses the appearance and short term character of a solid, and becomes soft and readily susceptible to deformation rather than fracture.

The roofing asphalts suitable for pitched roofs and with which this invention is especially covered are customarily heated in proximity of their application to roofs in portable heating or furnace units, usually on wheeled trailers adapted to be towed by an automobile or truck, to a temperature of about 440° F. to about 525° F. A portable roofing asphalt heater of the trailer type is provided for this purpose and is designated generally at 30 in FIG. 5, the same being of conventional type, and includes a frame 32 mounted on ground support wheels 34, and a frame tongue 36 having a tow hitch 38. A prop structure 40 is provided for selectively supporting the frame tongue 36 as shown.

The heater has a vat, not shown, normally covered by a retractable hood 42 and burner means, not shown, is provided for heating the contents of the vat, such burner means being fueled by fuel carried in a fuel tank 44. If desired the burner means can be regulated by thermostatically control means, not shown, for maintaining the contents of the vat at a predetermined tem-

perature that is usually in or about the temperature range of about 440° F. to about 525° F.

In any event, the vat and the opening thereinto is adequate to accommodate the introduction of a package **10** dimensioned as aforesaid. As will be explained in greater detail hereinafter, the entire package **10** inclusive of the enveloping film **14** is charged into the heating unit **30** and there is no need or useful purpose in separating the film **14** from the asphalt, as the film is incorporated into the entire bulk or mass of asphalt in the vat without any deleterious effect thereto.

If desired the package **10** can be broken into two or more parts by hammering the same or by subjecting the same to a sharp or high bending moment when at any temperature well below the softening or melting point of the asphalt **12,** so that an amount of less than 50 pounds of asphalt can be charged to the heater **30** when desired, but here again there is no need to separate the film **14** from the asphalt **12.**

It should be noted that while the strength of the film **14** portion of the package **10** is sufficient to prevent appreciable cold-flow of the asphalt **12,** it is not so strong as to prevent fracturing or break up of the package **10** as a catastrophic event on heavy hammering or the application of sharp or shock bending moments of high intensity. Thus the packages **10** can maintain their integrity of configuration despite any cold-flow characteristics that the asphalt **12** may have, and they can also stand normal handling without breakage, and yet be such as to be breakable into parts if desired at the site of use immediately prior to placement in the heater **30.**

The characteristics of the package **10** described above are due to the above described characteristics of the asphalt **12,** and are in part due to the dimensions of the package **10** previously given. The characteristics of the package **10** are in great measure attributable to the character of the film **14** and its thickness. The film **12** is a thermoplastic resin of high strength, is non-tacky, has little or no tendency to adhere to the inner surface of a boatlike mold **46** in which the package **10** is molded or formed, is completely compatible with the asphalt **12** and produces no detectable deleterious effect thereon (at least in very low concentration), and has a softening or melting point substantially above the highest temperature (about 325° F.) at which the asphalt **12** is poured into the mold **46,** and is in the neighborhood or below the lowest temperature (about 440° F.) to which the asphalt **12** is heated in the heater **30** prior to roof application.

A polyester resin film of 0.0005 inch thickness marketed by D. I. du Pont as its Type A polyester film under its trademark MYLAR is especially well suited. The condensed Chemical Dictionary — 5 Edition — Reinhold Publishing Co., 1956, states on page **746** that MYLAR is the du Pont trademark for a highly durable, transparent film of polyethylene terephthalate resin, characterized by its outstanding strength, electrical properties and chemical inertness. A publication of du Pont relative to MYLAR states that Type A MYLAR has the following characteristics and uses:

"Characteristics — A strong, tough polyester film with low electrical fault count. Transparent in 50 and 100 gauges whereas the heavier gauges such as 500 and above are translucent.

"Electrical Uses — Slot liners, wedges and phase insulation for motor and field coils; insulation for magnet wire and as a barrier and insulation tape in cable construction; insulation between turns in transformer coils; backing for mica.

"Non-Electrical Uses — Base for magnetic recording tape and other speciality tapes; surfacing material for acoustical tile; industrial laminations with other flexible materials release sheet for reinforced plastics, stationery supplies (in lighter gauges), engineering reproduction materials; apparel stays; etc."

The above described Type A of polyester resin film (MYLAR) has a softening or melting point far above 325° F. and is about 480° F. or below. This resin film softens and weakens at a temperature of 440° F. to such an extent that it disintegrates and simply is diffused or is absorbed and mixes with the asphalt **12** about which it enveloped in a package **10** when the temperature is raised to about 440° F.

Such polyester resin film **14** does not deleteriously effect the asphalt **12** on being mixed with or incorporated into the mass of the latter. The above described polyester resin film **14** is also preferred because it has virtually no tendency to stick or adhere to the inner surface of the (polyethylene) mold **46** and because only a one-half mil thickness is adequately strong to prevent appreciable cold-flow of the described pitched roof type roofing asphalt **12** in its package dimensions, and yet will yield to shocks sufficient to fracture the asphalt **12.**

Other polyester resin films having a softening point in the requisite range (above about 375° F. to about 480°F.) can be used and these as well as the previously described resin can, of course, be of about one-half mil thickness. Thicknesses of two mils or more can be used but tend to be too strong to enable breaking a package **10** into smaller parts, at least without substantially greater effort. Greater thickness also becomes relatively less economical, polyester resin films being fairly expensive by weight. Thicknesses of less than one-half mil may tend to lack sufficient strength, and for this reason and for the reason that substantially thinner films are so light and are difficult to handle in moving air that they are not recommended despite lower cost.

While other thermoplastic resins of proper physical properties may exist and can be used, polyester resin films, such as marketed under the trademark MYLAR, are the only films that have been found to be satisfactory in every respect and are far and away the most preferred of all that have been tried. Specifically, polyethylene films and saran resins have been found decidedly unsatisfactory. The desired or necessary physical properties have been set forth earlier and include being non-tacky, strong, being thermoplastic and melting above about 375° F. and preferably between 440° F. and 480° E., and being compatible with the asphalt.

The present invention does not produce satisfactory results with respect to low soft point asphalts (such as suited only for dead level roofs) as they are so fluid and cold flow so readily as to require totally impractical thickness of film. Accordingly, the present invention only has applicability to asphalts or physically similar materials which have little if any tendency to cold flow at temperatures to which the packaged material will normally be subjected in storage or during shipping. This excludes the invention from practical applicability to roofing asphalts having a soft point lower than about 170° F. as measured by standard test procedures.

Such roofing asphalts cold flow to such a minor degree, if at all, at normal storage and shipping temperatures that the resin film **14** can readily when of about one-half mil thickness accommodate, by reason of its inherent resiliency or stretchability, the dimensional changes that might occur over a prolonged period of time. In actual tests thus far conducted, no package **10** in accordance with the invention has failed in a period of hot summer months and it is expected that few, if any at all, would fail in stacked storage, say, eight packages high, in over a year.

The boatlike mold **42** can be of metal (aluminum or steel, for example) and lined or unlined by some surface coating such as polytetraethylflouride (as sold under the trademark TEFLON) for its non-tackyness and slippery nature; however, the mold **42** is subjected to rough handling and deformative damage, and consequently, the present invention employs boatlike molds **46** made of high density polyethylene, it having been found that such molds **46** having wall thicknesses of about 0.20 inch and greater are quite rugged, are not excessively expensive, do not readily adhere to polyester resin film, can be easily cleaned of asphalt with a small quantity of kerosene or other readily available solvents, have substantial salvage value, and have an adequate thermal conductivity to cool asphalt therethrough at a reasonable rate.

The shape of the mold **46** will be readily appreciated from the drawings, the same including a flat bottom wall **48** that is integral with upstanding end walls **50** and upstanding side walls **52.** The end walls **50** as well as the side walls **52** diverge slightly upwardly to afford draft and to facilitate removal of the package **10** from the mold **46.** For reinforcement and in order to provide good handholds for manual handling of the molds **46,** when filled as well as when empty, the upper peripheral margins of the end and side walls **50** and **52** are bent outwardly and thence turned downwardly to define a continuous peripheral rim **54** about the top of the mold 46 that is of an inverted U-shape in transverse section. The horizontal internal dimensions of the mold are 24 inches ×12 inches. The internal height of the mold 46 is substantially more than the height of the product or package **10** of about 5¼ inches and can conveniently be about 6½ inches so that the operator can quite accurately estimate visually when the mold **46** has been filled to the proper depth, and yet run no risk of overfilling and also be sure of the buoyancy of the charged mold **46.** The mold **46** can be of greater height if desired or deemed efficient. A height of 6½ inches assures that it is not necessary to entirely fill the mold **46,** and will assure buoyancy and stability (one could even say sea-worthiness) when the mold **46** with a package **10** therein is floating on water.

Attention is now directed to the apparatus whereby a package **10** of enveloped asphalt is molded within a mold **46** and cooled.

Referring to FIG. **6,** it will be seen that there is provided a plurality of straight, elongated and parallel troughs, such as those indicated at **60, 62, 64, 66, 68** and **70.** Such plurality of troughs are substantially horizontal and are such as to contain static water at substantial depth from end to end. The plurality of troughs **60, 62, 64, 66, 68** and **70** are arranged in a side-by-side relationship so as to constitute a rectangular array thereof **72** having parallel opposite ends **74** and **76** and parallel opposite sides **78** and **80.** The array **72** of troughs **60–70** are elevated above a floor or working surface **82** and are supported by peripheral masonry or concrete end walls **84** and side walls **86,** and by transverse walls **88** connecting the side walls **86** at spaced positions intermediate the end walls **84.**

The character of the troughs **60, 62, 64, 66, 68** and **70** can be best appreciated upon reference to FIG. **14,** wherein exemplary troughs **64, 66** and **68** are shown in detail. As clearly depicted each of the troughs is made of a single sheet of steel that is generally of channel-like configuration and includes a flat central or bottom wall portion **90** that has upturned side edges defining parallel, spaced vertical walls **92** and **94** of equal height, and the upper edges of the walls are bent outwardly at **96** and **98,** respectively, and thence upwardly at **100** and **102** to define oppositely extending horizontal shoulders **104** and **106** of equal height and horizontal extent and upstanding vertical and parallel walls **108** and **110.** The outer faces of the walls **108** and **110** of adjacent troughs abut each other, and the upper edge portion of the wall **108** is bent about to embrace the upper edge portion of the abutting wall **110** as plainly illustrated at **112** in FIG. **14.** Such arrangement prevents water from entering between abutting walls **108** and **110** from above and facilitates assembly of an array of troughs in close juxtaposed arrangement. Identity of the troughs enables prefabrication of troughs at a relatively low cost.

The opposite open ends of the troughs are conveniently closed by upward extensions **114** of the end walls **84** in sealing relationship to the opposite ends of the assembled trough structures shown in FIG. **14.** Similarly the side walls **86** are extended upwardly a sufficient amount to afford lateral support to the walls **108** and **110** of the troughs **60** and **70.**

The side walls **92** and **94** of the troughs have a spacing less than the overall width of the mold **46,** and greater than the spacing of the outer surfaces of the side walls **52** of the mold **46.** The side walls **92** and **94** have a height greater than that of the mold rim **54** above the bottom wall **48** of the mold. The upper side wall portions **108** and **110** of the troughs have a greater spacing than the overall width of the mold **46** including, of course, its rim **54.**

As thus far described each of the troughs **60, 62, 64, 66, 68** and **70** is adapted to contain water **116** of sufficient depth so as to float (see FIG. **16**) a mold **46** containing a package **10** with the bottom wall **48** spaced above the bottom wall **68** of the trough in an arrangement that all submerged portions of the mold 46 are exteriorly surrounded by water. The arrangement is such that a charged mold **46** (by which is meant a mold into which the asphalt **12** and film **14** to consitute a package **10** has been placed) can be floated from the charging end of each trough (the end of the trough at the end **74** of the trough array **72**) to the discharge end of such trough (the end of the trough at the end **76** of the trough array **72**). Indeed, not only can a charged mold **46** be floated the entire length of each trough **60, 62, 64, 66, 68** and **70,** but a mold **46** is caused to move in such trough within which it may be disposed from the charging end thereof to the discharge end thereof by movement of water in the trough from the charging end to the discharge end of the trough. As will be seen shortly, water in the troughs not only supports or buoys up the charged mold **46,** but it also transports or moves the charged mold 46 from the charging to the discharge

end of the trough; and furthermore, will so supporting and transporting the charged mold **46**, the water **114** constitutes a heat exchange medium for cooling the charged mold **46**, it being noted that the asphalt **12** is charged into the mold **46** at a temperature in excess of about 275° F. and must be cooled well below its softening or soft point which may be as low as 170° F.

A generally L-shaped water return trough designated generally at **120** has one leg **122** mounted along the exterior **122** of the wall **84** at the discharge end **76** of the array **72**. The trough leg **122** is disposed below the top of the wall **84** and the troughs **60, 62, 64, 66, 68** and **70** are provided with overflow weirs such as indicated at **124** in FIG. **16** in an arrangement whereby the water **116** in the troughs can overflow as at **126** into the trough leg **122**. The trough leg **122** has a closed upper end **128** and slopes gently downwardly along the wall **84** to its juncture **130** with the other leg **132** of the trough **120**.

The leg **132** is mounted upon and extends along one of the walls **86** at the edge **80** of the array **72** and is sloped to deliver water received from the leg **122** to a position adjacent the charging end **74** of the array **72**.

At the position **134** the return trough leg **132** opens into an oppositely extending discharge trough **136** that is arranged to dump or discharge into a settling tank **138**, wherein solid foreign matter that may be in the water can settle out. Though not shown, the tank **138** can be disposed outside of a building structure, not shown, that houses and shelters all the structure thus far shown, excepting only a trough portion **140** at the discharge end of the trough section **136** that can extend through an exterior building wall, not shown. Disposing the open topped settling tank **138** exteriorly of any sheltering building facilitates the air cooling of water that will have become heated in the course of cooling molded asphalt.

A water supply tank **142** is provided that is also preferably disposed for air cooling of its contents, such tank being at a height sufficient to supply water by gravity flow to a water supply manifold **14** through a water line **146** connecting the tank to the manifold. A line **148** having a water pump **150** therein connects the settling tank **138** to the elevated water supply tank **142**.

Referring now especially to FIG. **13**, the water circulating and cooling system will be readily understood. The water supply tank **142** is maintained at a predetermined leval by introduction of water thereinto from water mains, water wells or the like, not shown, to the extent that make-up water is required. Water in the tank **142** is gravity fed by line **146** to the water manifold **144**, the latter extending along the charging end of the troughs **60, 62, 64, 66, 68** and **70**, with each of such troughs having communication by individual valve controlled conduits **152** with the manifold **144**. Such valve controlled conduits are all identical to each other and an appreciation of all can be had on reference to FIGS. **7** and **8** wherein the valve controlled conduit **152** provided in association with the charging end of the trough **66** is clearly shown as comprising a manually controlled valve **154** tapped into the manifold **144** and connected by an elbow **156** to an inclined pipe **158** that extends downwardly to a position adjacent the bottom of the trough **66**. The outlet end of the pipe **158** terminates in an elbow arranged to discharge water in a direction parallel to the major dimension of the trough **66** and towards its discharge end.

The operator of the apparatus can individually control the rate of water introduction into and consequently the water flow rate in each trough.

Recapitulating, water from the tank **142** flows in the pipe **146** in the direction indicated by the arrows **162** to the manifold **144**, and flows in the latter as indicated by the arrows **164** to the various distributor means or valve controlled conduits **152**.

Water thence flows in the various troughs of the array **72** as introduced therein in the direction indicated by the arrows **166**, and thence in the trough **120** as indicated by the arrows **168** to discharge gravitationally into the settling tank **138** as indicated at **170**. Water from the tank is then pumped via the line **148** to its point of starting.

The L-shaped trough **120** and the juncture **130** of its legs are such that empty molds **46** placed in the trough **120** at any position therealong is carried or urged along such trough by the water movement **168** therein to the position **134** that is in close proximity to the charging end **74** of the array **72** and to one end of an endless conveyor designated generally at **180**. The conveyor **180** includes an upper flight **182** at a height about the same as that of the trough array **72**, and the conveyor **180** is parallel to, substantially coextensive with, adjacent to, and spaced from the charging end of the array **72**, and the upper flight **182** travels in the direction indicated by the arrow **184**. Such arrangement as will be seen greatly facilitates repetitious use of each mold **46**.

During continuous operation of the equipment, it has been found that no problem of water freezing has been encountered despite ambient air temperatures that have ranged to as low as about 3° F. No water freezing problems are anticipated under the climatic conditions of Kansas, for example; however, the water tanks exposed to weather should be drained during shutdowns in cold weather. It is well within the realm of ordinary skill to avoid freezing problems including the use of an antifreeze, or using salt brine instead of pure water (provided the troughs and the tanks have adequate rust resistance or suitable coatings).

A heated supply of asphalt is provided comprising an asphalt supply tank **190** having an asphalt fill opening (not shown) normally closed by a cover **192**. The tank **190** has a false bottom **194** for containing the asphalt **196**, and a gas burner means **196** having a gas supply line **198** is disposed in the tank **190** below the false bottom **194** and the hot combustion products of the burner means **196** via a plurality of flue tubes, not shown, disposed within the mass of asphalt **196** to the upper portion **200** of the tank **190** for ultimate discharge from the tank **190** by a chimney **202**.

Hot asphalt **196** in the tank is moved via a discharge line **204** and pump means **206** in the direction indicated by the arrows **208** to an asphalt supply manifold **210**.

The line **204** and the manifold **210** are both heavily insulated to avoid loss of heat, and in order to facilitate ease of starting both of such conduits can be provided with heating means embedded in the heat insulation thereof; however, such heating means is shown only in conjunction with the manifold, as those conversant with handling asphalts and the like will understand that similar heating means can be provided for the line **204**.

The asphalt manifold **210** comprises (see FIGS. **10** and **11**) a steel pipe **212** spaced above the charging end of the array **72** and supported by U-shaped braces **213** welded thereto, it being understood that the braces **214** are dependingly supported by ceiling or roof structure, not shown. Welded to opposite sides of the pipe **212** are a pair of relatively small steel steam pipes **216** and **218** through which steam under pressure is circulated to heat the pipe **212** sufficiently to maintain the asphalt contents thereof at a temperature on the order of about 275° F. to 325° F. for pouring or molding operations presently to be described.

The pipe **212** and the steam heater pipes **216** and **218** are embedded in or heavily encased in thermal insulation such as wrapped asbestos **220.**

Conventional means for controlling the circulation, temperature and supply of steam circulated in the pipes **216** and **218** is designated generally at **222**; and the character and operation of the same is well known.

The manifold **210** is provided with a plurality of individually (valve) controlled outlets **224**; one each directly above each of the troughs **60, 62, 64, 66, 68** and **70** in closely spaced relation to the charging end thereof. Each of the valve controlled outlets **224** comprises a downwardly directed pipe **230** connected to the interior of the manifold pipe **212** and in which there is a valve having a wrench actuable valve control member **232** whereby an operator can close the pipe **230** and open the same to any desired degree. The arrangement is such that a mold **46** over which a rectangular sheet of polyester resin **14** has been placed and pressed down in the mold **46** sufficient to establish a pocket therein can be floated in water **60** in the trough at the charging end of the latter (see FIG. **12**) and the valve member **232** actuated to open the pipe **230** and to flow or pour asphalt as a stream **240** into the film lined mold until the latter is filled the desired depth of about **5¼** inches. Prior to, during or after the charging operation, water can be introduced into the trough to cause flow of water in such trough, overflow of water at the discharge end of the trough, and to transport the charged mold **46** toward the discharge end of the trough. While largely a matter of choice, it is preferred to defer initiation of the introduction of water until the mold **46** has been charged so as to avoid any premature movement of the mold **46** prior to its having been fully charged.

As soon as the mold **46** has been charged, the free edge margins of the sheet or film **14** can be dressed down over the top of the asphalt though such dressing down can be deferred to any time prior to emptying the mold **46.** The film **14** is conveniently cut in rectangular or square form and with the mold **46** dimensioned as previously described can conveniently be about **48** by **48** inches. obviously, such size of film sheet is far more than necessary to cover the exterior of the molded asphalt **12**; however, such excessive size is fully or in large measure warranted by requiring far less care in centering a sheet over an empty mold and in pushing the center down in the mold to form a film pocket therein for reception of asphalt. Precise centering is not required, which would necessitate greater care and a greater expenditure of time preparatory to charging or filling the mold, but additionally the operator does not have to exercise relatively greater care in dressing down the free upstanding marginal edges of the film over the top of the poured asphalt in order to assure full coverage of all exposed surfaces of the asphalt. Indeed, rather lavish proportioning of the film enables the operator who pours the asphalt to immediately after the pouring to dress down the free marginal edges of the film without incurring any undue risk of burning his bare hands in the hot asphalt. All parts of the marginal edges of the film that contact the asphalt adhere thereto, and no detriment results in excess film area extending free.

The excessive film area not only facilitates the handling of the film prior to and after the pouring of the asphalt, but also assures all exterior surfaces of the asphalt being covered and not only sheltered from surface contamination, but most importantly prevents the asphalt from contacting and adhering to other packages or other materials or structures.

The operator can line or provide a mold **46** with the film **14** after he receives the mold **46** on the conveyor **180** at the location of the trough to be used, or an assistant can operatively associate a mold **46** and a sheet or piece of film **14** at a position adjacent both the return trough **120** (position **134**) and the conveyor **180,** and place such associated parts on the conveyor **180** for delivery to the location of the trough in which it is to be charged.

The movement of charged molds **46** in a trough as indicated by the arrows **250** is not of positive character and such charged molds **46** can and normally do pile up end-to-end against the discharge end of the trough. Water can, of course, continue to flow by such backed up charged molds **46** and in flowing thereby continue to cool the exterior of the molds **46** and, of course, the contents thereof.

In an actually working emboeiment of the above described apparatus wherein troughs of 100 feet length are used, it can typically take hours for a charged mold **46** to cool sufficiently for emptying. A single operator can quite easily completely fill a trough of 100 feet length long before the earliest charged mold **46** is ready for discharge, and it is therefore desirable to provide more troughs than the number of operators that are to be employed; otherwise inconveniently long troughs would be required. In practice with 100 foot troughs, it has been found that the rate of cooling is typically such that one operator can make beneficial use of eight or more troughs.

When a charged mold **46** at the discharge end of a trough has cooled sufficiently to be discharged, the film **14** will be dressed over the surface of the asphalt if this has not already been done, and then grasping the mold **46** by its rim **56** as shown in FIG. **19** lift the charged mold **46** from the discharge end of the trough and then turn to his rear while inverting the mold **46** to drop its contents (see FIG. **20**), namely, the package **10** upon a conveyor means **260** disposed at his rear. If the package **10** does not fall of its own weight, a minor degree of ingenuity on the part of the operator in the way of tapping the bottom of the mold or by dropping the same inverted on the conveyor means **260.** Upon the mold **46** being freed of its contents, the operator places the same, upright, of course, in the water return trough **122** for water urged transport to the position **134** for reuse of the mold **46** as previously described.

The conveyor means **260** is parallel to and is spaced from the discharge end of the array **72** as clearly shown in FIG. **6.** The conveyor means **260** has an upper flight **262** that is about the same height as the trough array

72, and the flight 262 can be arranged to travel in either direction of its length to deliver all packages 10 processed from all the troughs to a common cargo handling point or automatic cargo handling equipment, not shown.

The packages 10 preclude the waste of time and effort normally required at the site of a roofing job of removing packaged asphalt from its containers. Customary containers are unsuited for incorporation into the roofing asphalt itself.

A most beneficial result is in the nature of preserving our ecology and in minimizing land and air pollution. In utilizing the packages 10, there is no residue or refuse in the nature of empty asphalt containers about the roofing site to offend the eye, and no ill consequences occasioned by the burning of used container refuse such as smoke, odorous fumes or noxious combustion products. There is no need to haul such refuse away or to provide dumps or other remote disposal means. These benefits are even greater than the not inconsiderable expense of the wasted containers and the cost of attempting to dispose of the same.

Attention is now directed to the appended claims.

I claim:

1. In packaging apparatus, the improvement comprising an elongated trough extending between charging and discharging stations adapted to contain water, a boatlike mold disposed in said trough and adapted to float on water in the trough for movement between the stations, means at said charging station for depositing a quantity of the material to be packaged into the mold when the latter is at the charging station, and means for moving the mold along the trough to the discharging station.

2. The combination of claim 1, wherein said means for moving the mold comprises means for moving water in the trough from the charging to the discharging station.

3. The combination of claim 2, wherein the means for moving the water includes means for receiving water from the trough adjacent the discharge station and for delivering water so received to the trough adjacent the charging station.

4. The combination of claim 2, wherein said means for moving the water includes means for receiving water from the trough adjacent the discharge station, and means inclusive of a pump for delivering water so received into the trough adjacent the charging end.

5. The combination of claim 4, including a second elongated trough having first and second portions that are respectively relating closer to the discharge and charging stations of the first mentioned trough, said second trough being sloped downwardly from the first to the second portion thereof whereby water therein will flow from the first to the second portion thereof, said first portion of the second trough being disposed at a height less than that of the first mentioned trough at the discharge station of the latter, means for overflowing water in the first mentioned trough that is above a predetermined depth at the discharge station into the first portion of the second trough, and with said pump being disposed to receive water from the second portion of the second trough in an arrangement such that the mold can be removed from the first mentioned trough at the discharge station, and placed in the first portion of the second trough for water urged movement in the second trough to a position in the second portion of the latter in closer proximity to the charging station.

6. The combination of claim 5, including a conveyor for moving a mold from adjacent said position to a second position in relatively closer proximity to the charging station.

7. The combination of claim 3, wherein said means for receiving and delivering water includes means for cooling the water prior to delivery thereof.

8. The combination of claim 3, including a water storage tank disposed at a height greater than the charging station, whereby water can be delivered by gravity flow from the tank into the trough adjacent the charging station of the latter, and a pump for pumping received water into the tank.

9. The combination of claim 3, wherein received water is placed in direct heat exchange relation with the atmosphere for cooling thereof prior to delivery into the trough.

10. The combination of claim 3, wherein received water is placed in indirect heat exchange relation with the atmosphere for cooling thereof prior to delivery into the trough.

11. Asphalt packaging apparatus comprising a plurality of elongated and generally parallel troughs disposed in a generally rectangular array with each trough having one end at one end of the array and its other end at the other end of the array, means for introducing water into each of the troughs at its said one end, means for removing water from the other ends of the troughs, a plurality of boatlike molds adapted to float in said troughs in heat exchange relation with water therein and to be moved by water movement therein from the one end to the other end of each trough, and means for pouring a quantity of hot asphalt into said molds when floating at said one end of each of said troughs.

12. The combination of claim 11, wherein the means for pouring includes an asphalt dispensing manifold extending along said one end of the rectangular array, means for maintaining contents of the dispensing manifold at an elevated temperature suitable for dispensing asphalt therefrom, said asphalt dispensing manifold having a valved outlet above each of the troughs adjacent said one end of the troughs.

13. The combination of claim 11, wherein the means for introducing water includes a common water supply and each of said troughs having individually associated therewith a valve controlled means that is coupled to a water supply.

14. The combination of claim 11, including an endless conveyor means adjacent to and parallel to said one end of the rectangular array for moving molds from adjacent a corner of said array along a travel path adjacent said one end of all the troughs.

15. The combination of claim 14, including an endless conveyor adjacent to and parallel to the other end of the rectangular array for moving packaged asphalt from adjacent said other ends of all the troughs toward a single cargo handling location.

16. The combination of claim 11, wherein the means for introducing water and the means for removing water are operatively associated by means for returning removed water to the water introducing means, whereby water is recirculated through the troughs.

17. The combination of claim **16**, wherein the means for returning water includes means for cooling the water.

18. The combination of claim **16**, wherein the means for returning water includes an elongated generally L-shaped water return trough having first and second legs, said first leg paralleling and being disposed adjacent said other end of the array, and said second leg extending along a side of the array to a position adjacent said one end of the array, said water removing means including said troughs and the first leg of the return trough being arranged for the gravitational overflow of the former into the latter, and said return trough having its legs sloped so that water therein flows to said position, whereby empty molds can be placed in the first leg of the return trough for water urged movement in said return trough to said position.

19. The combination of claim **18**, including a conveyor means parallel to and adjacent said one end of the array for moving molds from adjacent said position along a path adjacent all said one end of the troughs.

20. The combination of claim **19**, including a water supply vessel in heat exchange relation with ambient atmosphere, and means for moving water from the return trough to said vessel.

* * * * *