Aug. 1, 1967 G. G. KENNEY 3,334,167

METHOD AND APPARATUS FOR PREPARING PENCIL PITCH

Filed Nov. 13, 1963 2 Sheets-Sheet 1

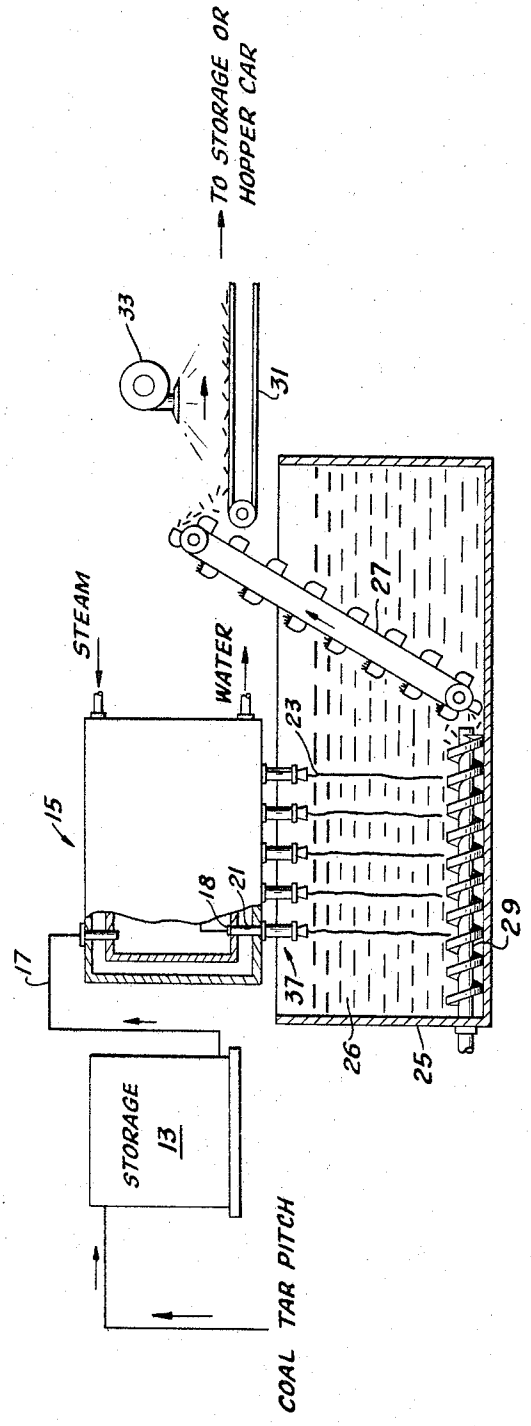


FIG. 1

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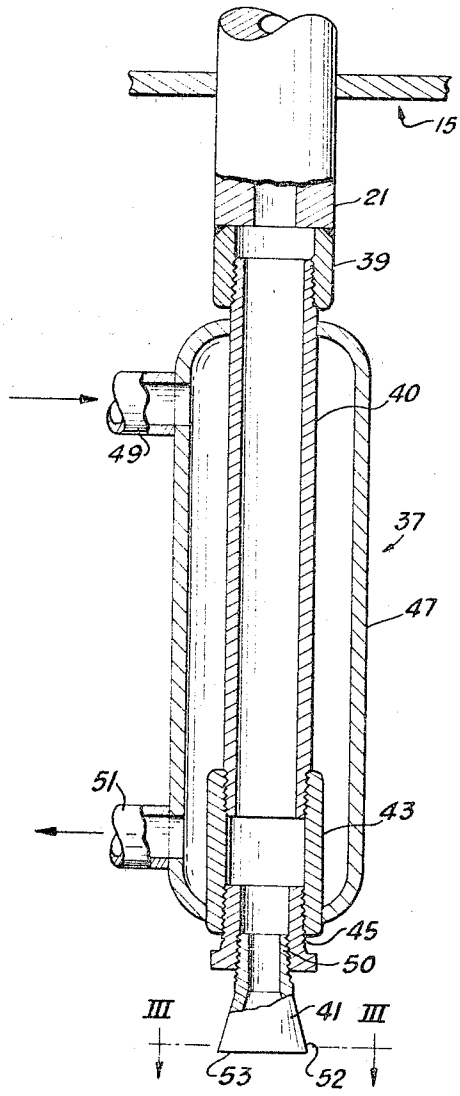


FIG. 2

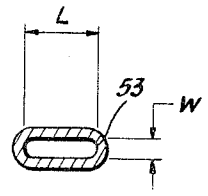


FIG. 3

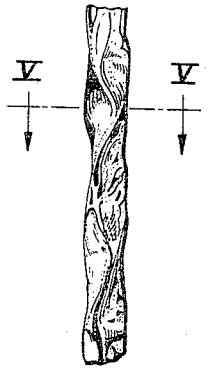


FIG. 4



FIG. 5

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METHOD AND APPARATUS FOR PREPARING PENCIL PITCH

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3 Claims. (Cl. 264—167)

This invention relates generally to the shaping of resinous products, such as pitch, and more particularly to a method of extruding pitch to obtain rods having a solid core.

Coal tar pitch is the heavy dark residue resulting from the distillation of coal tar. It is a lustrous, brittle mass when it is cold but, dependent upon the degree of heat to which it is subjected, may become a semisolid to syrupy mass. These characteristics create problems since the manufacturer that makes use of the pitch is generally located some distance from the tar distillation facilities. Thus, the finding of a convenient and practical means for transporting the pitch has long been a problem. One solution has been to flow the molten pitch from the still directly into railway tank cars. This has the disadvantage that the pitch solidifies on cooling, so the tank cars must then be heated at the destination to remelt the pitch so that it may be unloaded. Another solution has been to cast the pitch in large concrete bays and comminute the casting by mechanical means to sizes which can be conveniently handled. This creates problems since a large number of fines are produced which fill the voids between the larger pieces and due to the cold flow properties of the pitch cause them to fuse together.

The preferred method of forming pitch into shape for handling and transportation is known as the "pencil pitch" process. This involves flowing molten pitch through a plurality of circular nozzles and as a plurality of circular streams into a tank of cold water which cools the pitch streams into solids having a cylindrical shape. These pencils are then removed from the water bath and conveyed to storage or to a hopper car for transport.

Although this pencil pitch process is perhaps the most convenient, it has a number of disadvantages, resulting mainly from the fact that when the pitch streams solidify on entering the water bath, the surface hardens to a hard shell while the center is still liquid. Thus, when the center hardens it shrinks, leaving a substantially cylindrical hole running along the axis of the pencils. The diameter of the hole, being at times as much as a third of the diameter of the pencils themselves, weakens the pencils so they are easily broken in transit to produce a large percentage of fines. It also has the serious drawback of entrapping water within the pencils which cannot be removed by any convenient drying means. The presence of this water, which may be as much as two to five percent of the dry weight of the pitch, causes steam and odor problems when the pitch is later processed. Since the pitch must be remelted at a temperature above the boiling point of water for forming into a finished shape, the water vapor evolved carries with it an odoriferous distillate from the pitch. A still further disadvantage is that the uniform cylindrical shape of the pencils presents a large area of contact surface which due to cold flow properties of the pitch will cause the pitch pencils to stick together when they are shipped during warm weather.

This invention avoids the foregoing difficulties by producing a pitch pencil having a solid core and a surface contour which is highly irregular.

In accordance with the invention, molten pitch is formed into a plurality of streams having a substantially oval shape. These streams are directed into a cooling zone maintained at a temperature below the melting point of the pitch where they solidify and the solid pencils are removed from the cooling zone and dried.

The objects and novel features of the invention will appear more fully from the following detailed description when the same is read in connection with the accompanying drawings. It is to be understood that the drawings are not intended as a definition of the invention, but are for purposes of illustration only.

In the drawings wherein like parts are labeled alike:

FIGURE 1 is a highly schematic flow diagram illustrating the process of producing pencil pitch,

FIGURE 2 is a vertical cross-section of an embodiment of the novel extrusion apparatus,

FIGURE 3 is a cross-section taken on line III—III of FIG. 2,

FIGURE 4 is an illustration of a pitch pencil made in accordance with the invention, and

FIGURE 5 is a cross-section taken on line V—V of FIG. 4.

Referring now to FIG. 1, coal tar pitch is conveyed to storage tank **13** and then to extrusion tank **15** by means of line **17**. Conventional carrot valves **18** are opened and pitch flows through circular pipes **21** and through extruding nozzles **37**, FIG. 2, as streams **23** into cooling tank **25**, which is filled with water **26**. Streams **23** are cooled by water in tank **25**. The streams solidify and fall to the bottom of the tank. The solid rods thus formed are broken into lengths and conveyed to bucket elevator **27** by means of screw conveyor **29**. Bucket elevator **27** transports the pencils to a belt conveyor **31**. The moisture is removed from the pitch pencils by air blower **33** after which they are conveyed to storage.

Referring now to FIG. 2, for details of embodiment of the novel apparatus, nozzle **37** is attached to feed tank **15** by means of circular pipe **21** and coupling **39**. Nozzle **37** comprises pipe **40**, which is connected to a feed tip **41** by means of coupling **43** and bushing **45**, and steam jacket **47**. Jacket **47** is provided with a steam inlet **49** and a condensate outlet **51**. The upper portion **50** of feed tip **41** is substantially tubular in shape having a circular cross-section. The lower portion **52** terminates in an oval orifice **53**. The cross section of the orifice is illustrated in FIG. 3. The inner diameter of feed tip **41** is gradually shortened along one diameter and lengthened along a diameter normal to the first so that a smooth transition is made from the circular cross section at **50** to the oval cross section at **52**. The cross sectional areas of the oval-shaped orifice and the circular upper portion are substantially the same.

As an example of the practice of the process of the invention, twenty five hundred gallons of pitch (M.P. 265° F.) at a temperature of 380° F. were placed in extrusion tank **15** having forty-four nozzles **37**. The carrot valves **18** at the top of openings **21** were opened and steam was introduced into jacket **47** to heat pipe **49** and to prevent solidification of the pitch in pipe **49**. Pitch at a rate of approximately 3,000 gallons per hour flowed down through nozzles **37** and out orifice **53** of tips **41** into the cooling water **26**. The orifices **53** of tips **41** had widths W of .25" and lengths L of .989" giving them each a cross sectional area equal to a circle of 9/16" diameter. The surface of the cooling water was located two inches below the end of feed tips **41** and its temperature was maintained at between 115–120° F. by circulating it to a conventional cooling tower. The solidified streams were broken into lengths by screw **29**, carried to bucket elevator **27**, lifted to belt conveyor **31** where the lengths were blown dry by air blower **33** are loaded into hopper cars.

The shape of the pencils produced in this manner is shown in FIGS. 4 and 5. It is believed that the twisted spiral form of the pencils is due to the shrinkage of the

pitch on cooling. The average length of the pencils is between two and six inches. The surface of the pencils has a bright shiny black finish as compared with the dull sheen of the circular pencils.

The temperature of the cooling water and pitch will depend on the type of pitch being extruded, as shown in Table I below.

TABLE I

Melting Point	Commodity	Pitch Temp., ° F.		Water Temp., ° F.	
		Min.	Max.	Min.	Max.
90–105° C....	Soft C Pitch..	320	350	85	95
105–115° C...	Hard C Pitch.	325	355	105	115
255–270° F...	Target Pitch..	375	395	110	125
285–300° F...	Core Pitch....	415	435	115	125

As can be seen from the table, pitch temperatures between about 120° and 250° F. above the melting point of the pitch give the correct viscosity properties to produce satisfactory pencils. The cooling water temperature is maintained from about 85° F. to about 125° F.

The distance between the ends of the nozzles and the surface of the cooling water can be varied between about ⅛ inch to about eight inches. If the distance is less than about ⅛ inch, permitting the nozzles and water to come in contact, the pitch foams on the surface of the water, rather than producing a pencil. If the distance is greater than eight inches, the soft pitch will tend to change from an oval to a cylindrical stream prior to entering the water bath, in which case the same problem as encountered in the old process will occur, in that the outer cylindrical surface of the pencil will harden, leaving a soft core which will shrink on cooling to produce a hole through its center. Due to gravitational effects the pitch streams will become smaller as the distance from othe ends of the nozzles to the water increases. The cross-sectional area of the stream with the nozzles eight inches above the water will be approximately 25 percent smaller than the cross-sectional areas of the orifices thus producing thinner pencils. Proportional decreases in size will occur when the distance between the nozzles and water is varied between about ⅛ inch to about eight inches.

With regard to the dimensions of the orifice 53, the width diameter W is critical and can be varied from about ⅛ to about ⅜ inch with the optimum at ¼ inch. The length L can be varied from about ¼ to six inches but conveniently is inversely varied with the width W to maintain a constant cross-sectional area. If the width W is less than ⅛ inch, plugging difficulties are encountered. If the width W is greater than ⅜ inch, uniform cooling throughout the pitch stream cannot be achieved and the center of the stream remains soft, as in the case of the cylindrical pencils, and when it hardens it shrinks to cause a hole through the center.

The foregoing has described an improved process for producing pitch pencils which overcomes the difficulties associated with prior methods. The pitch is transformed into a shape which is convenient for shipping and which

can be easily air dried to a moisture content of less than .05 percent. In previous processes, the moisture content varied between two and five percent due to water being trapped in the hollow core of the pencils. The twisted solid core product is stronger than the old round type and is subject to less breakage in handling resulting in fewer fines, which tend to clog machinery. The twisted spiral form of the pencils have less tendency to stick together during shipment, since there is a much smaller amount of surface in contact between the pencils than in the old cylindrical type.

I claim:

1. Method of making solid core pitch pencils from molten pitch comprising advancing said pitch in the form of a stream having a substantially oval cross-section, said cross-section having a width from about ⅛ to about ⅜ inches and a length from about ¼ inch to about six inches and cooling said stream in a liquid cooling zone located from about ⅛ inch to about eight inches below the top of said stream, said liquid being maintained below the melting point of said pitch whereby said pitch solidifies to a rod having a solid core and an irregular surface contour.

2. Method of making solid core pitch pencils from molten pitch comprising advancing said pitch, at a temperature of from about 120° to about 250° F. above the melting point of said pitch in the form of a stream having a substantially oval cross-section, said cross-section having a width of about ⅛ to about ⅜ inch and a length of about ¼ inch to about six inches, into water, whose surface is located from about ⅛ inch to about eight inches below the top of said stream and whose temperature is maintained from about 85° to about 125° F. whereby said pitch solidifies to a rod having a solid core and an irregular surface contour.

3. Apparatus for making solid core pitch pencils from molten pitch comprising a nozzle having a substantially oval shaped orifice, said orifice having a width of about ⅛ to about ⅜ inch and a length of about ¼ inch to about six inches, means for advancing said pitch in the form of a stream through said nozzle so that the stream has a substantially oval shaped cross-section of substantially the same dimensions as said orifice, a tank, means for flowing water into said tank so that the surface of the water in said tank is located from about ¼ inch to about eight inches below said orifice and the temperature of said water is maintained from about 85° to about 125° F., whereby said pitch contacts said water and solidifies to a rod having a solid core and an irregular surface contour.

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