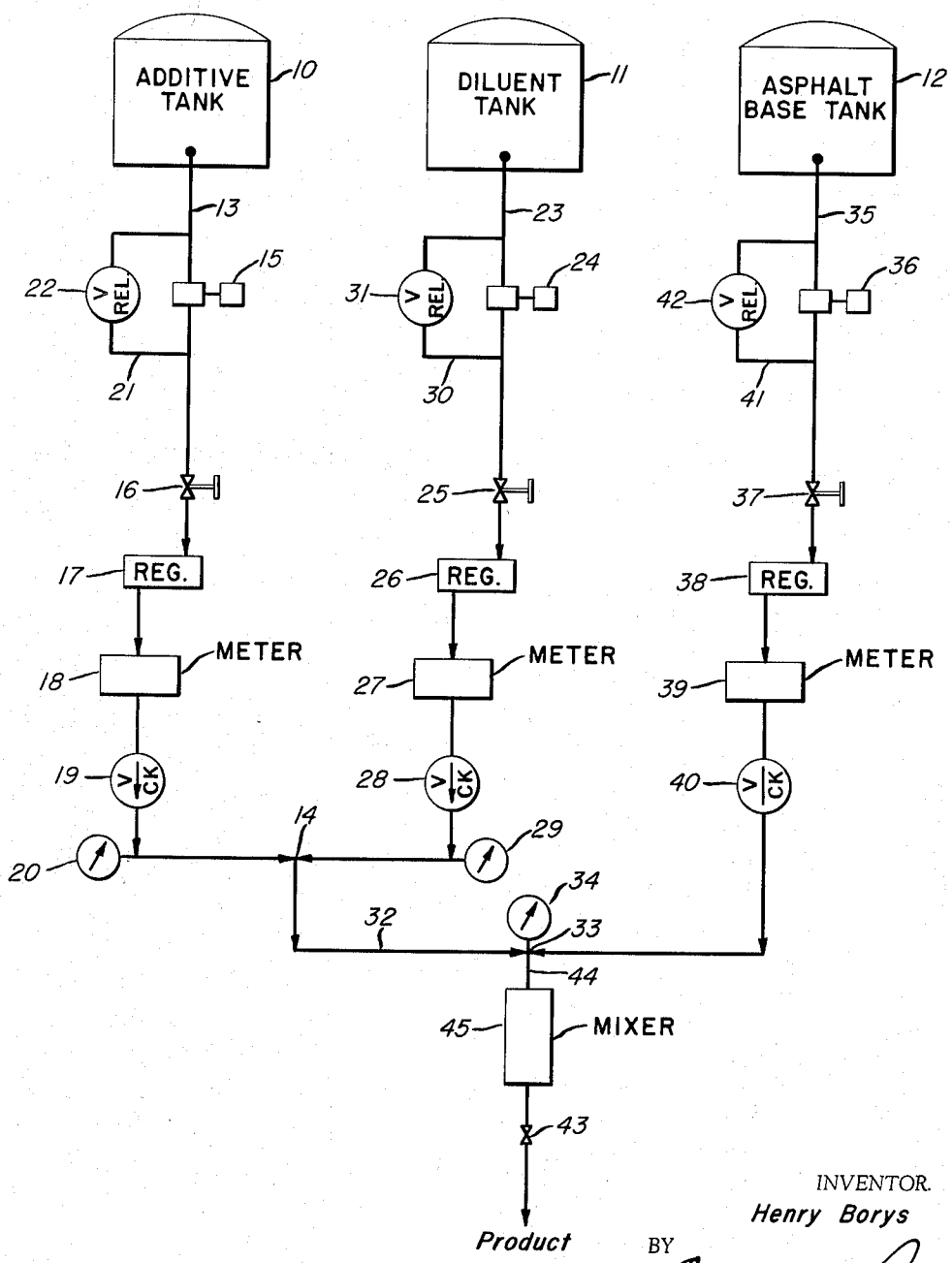
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ASPHALT BLENDING SYSTEM

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ASPHALT BLENDING SYSTEM

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This invention relates to the manufacture of asphalt, and more particularly to the continuous production of blended asphalt products.

Blended asphalt products such as road and roofing asphalts, have historically been produced by combining asphalt base, diluents or carriers, and additives in large tanks, to the desired specifications. In view of the broad spectrum of blended products and grades thereof and extreme variable demand for, such procedures required extensive tankage to provide product storage for anticipated product demand. Consequently there was a large investment in tanks, handling equipment and product inventory. Costs can be substantially reduced by the continuous blending of components and dispensing of the blended product to the transport vehicle if the components can be satisfactorily blended. Continuous production only requires component storage facilities rather than product storage thereby reducing inventory and still have all grades and/or products available at all times.

Any type of blended asphalt products can be prepared in accordance with the present invention. Illustrative of such blended products are cut-back asphalts comprising asphalt base, hydrocarbon diluent and desired additive, and aqueous asphalt emulsions comprising asphalt base, water as carrier and additives.

It is well known in the asphalt art to incorporate additives in asphalts for the purpose of improving the physical and chemical properties of the final product. The type of additive will depend on the product and the use to which it is put. However, the amount of additive is very small percentage of the finished product. The effective incorporation of small proportions in continuous flow has been made possible by the present invention.

In accordance with the present invention, a simplified and improved procedure and system is provided for continuously blending at least three components to produce a broad range of blended asphalt products. Briefly, the method comprises the steps of:

(a) Supplying diluent and additive to a blending zone in two separate streams;

(b) Blending said streams in continuous flow to obtain a blend;

(c) Directly dispensing the blend in continuous flow from the blending zone to a second blending zone;

(d) Continuously supplying a stream of asphalt base to the second blending zone;

(e) Blending said streams in continuous flow to obtain said asphalt product; and

(f) Directly dispensing said asphalt product in continuous flow from said second blending zone.

More specifically, the method of the invention for the continuous production of asphalt blends comprising preselected proportions of asphalt base, diluent and additive, comprises the steps of:

(a) continuously forming a blend of diluent and additive in preselected proportions by continuously delivering a metered quantity of each of said additive and said diluent to a first mixing zone;

(b) continuously flowing said blend to a second mixing zone;

(c) continuously forming in said second mixing zone a blend in preselected proportion of said asphalt base and first blend by continuously introducing a metered quantity of said asphalt base to said second mixing zone; and

(d) Continuously passing the resultant blend in continuous flow to a dispensing zone.

The attached schematic drawing is illustrative of the preferred embodiment of the system of the invention for the continuous in-line blending of components to produce blended asphalt products. In the drawing, appropriate storage tanks **10**, **11**, and **12** are provided for the additive, diluent, and asphalt base respectively. A transfer line **13** is provided from tank **10** to a first mixing zone **14**. Line **13** is further provided with pump **15**, valve **16**, pressure flow regulator **17**, meter **18**, check valve **19** and pressure guage **20**. A recycle line **21** with relief valve **22** is further provided for line **13** around pump **15**. A transfer line **23** is provided from diluent tank **11** to mixing zone **14**. Line **23** is similarly provided with pump **24**, valve **25**, pressure flow regulator **26**, meter **27**, check valve **28**, pressure gauge **29**, recycle line **30** with relief valve **31**. Line **32** connects first mixing zone **14** with second mixing zone **33** provided with pressure gauge **34**. Asphalt base tank **12** is connected to second mixing zone **33** by transfer line **35**. Line **35** is provided with pump **36**, valve **37**, pressure flow regulator **38**, meter **39**, check valve **40**, and recycle line **41** with relief valve **42**. Second mixing zone **33** is connected to dispensing valve means **43** by transfer line **44** through mixer **45**.

The system of the invention for continuously blending preselected proportions of an asphalt base, diluent, and additive to form an asphalt product having a preselected composition thus comprises:

(a) Separate containers for said asphalt base, said diluent, and said additive;

(b) A first mixing zone;

(c) Conduits individually communicating with said diluent and said additive containers and said mixing zone;

(d) A second mixing zone;

(e) A conduit communicating with said asphalt base container and said second mixing zone;

(f) Flow rate controlling means communicating with each of said conduits and adapted to deliver a metered quantity of liquid through each conduit to each of said mixing zones;

(g) A conduit communicating with said first and said second mixing zones; and

(h) A conduit communicating with said second mixing zone and dispensing means downstream from said second mixing zone.

A cut-back asphalt of the medium curing type (MC) was prepared in accordance with the present invention to illustrate the simplicity of the herein described continuous in-line blending procedure. The inspections of the asphalt base stock available indicated that 8% kerosene diluent was required to provide the requisite properties of viscosity, penetration, etc. In addition, this MC type asphalt required 2% anti-stripping additive to provide the proper cohesion with the aggregate to which the asphalt was to be added to for a paving asphalt. The additive used was a kerosene-type solvent solution of an amine-fatty acid reaction product. Thus the asphalt product to be formed consisted of 90 weight percent MC asphalt base, 8 weight percent kerosene and 2 weight percent additive.

The above asphalt blend was continuously formed at the rate of about 475 gallons per minute. The additive solution was pumped from tank **10** at an elevated pressure at a predetermined rate sufficient to provide the desired ratio of additive in the blend through a pressure rate regulator **17** having the desired capacity, then through meter **18** to first mixing zone **14**. The predetermined ratio of kerosene diluent from tank **11** is pumped through line **23**, pressure rate regulator **26**, meter **27** to said mixing zone **14**. Recycle lines **21** and **30** are provided to

recycle excess additive and diluent through pumps **15** and **24** respectively to provide adequate head of product to regulators **17** and **26**. Diluent and additive entering mixing zone **14** is preferentially conducted in a manner such that turbulent mixing occurs. If these streams are combined such that stratification and laminar flow of the effluent stream can occur, then inadequate blending of these 2 components will occur when introduced into the asphalt base in the second mixing zone **33**. Mixed diluent and additive is continuously removed from turbulent mixing zone **14** through line **32** to second mixing zone **33**. Simultaneously the predetermined ratio of asphalt base is introduced to zone **33** from tank **12** through line **35** and associated regulator **38** and, meter **39**. It is essential that turbulent mixing likewise be effected in zone **33**. The turbulent mixing can be best effected by bringing the respective streams together at 180° and taking the effluent mixtures from the zone at 90° F. Uniform blends can be insured by passing the effluent mixture from the second mixing zone **33** through a third mixing zone **45**. Mixer **45** can be a powered mechanical device or simply an enlarged conduit filled with variously sized balls that create tortuous passageways for the product and resultant mixing of the materials. From mixer **45**, blended product passes through dispensing valve means **43** to the transport vehicle.

The pressure rate controllers **17**, **26** and **38** can be of any design or construction, manually or automatically controlled. All that is required is that they deliver a given quantity of material per minute at the predetermined rate to provide the requisite ratio components in the desired asphalt product. Such devices are well known in the art.

In the operation of the continuous in-line asphalt blending system herein disclosed, it has been found that the continuous formation of the diluent-additive pre-mix prior to addition continuously to the asphalt base produces substantially uniform blended product. Consequently, the problems attendant with large volume batch blending of components are obviated, with concommitant reduction in costs.

I claim:

A system for continuously forming a blended liquid asphalt product from preselected proportions of liquid components comprising asphalt base, diluent, and additive, comprising the combination of:

(a) separate liquid supply containers for said asphalt base, said diluent, and said additive;

(b) a first continuous turbulent liquid mixing zone;

(c) a first conduit and a second conduit, each of said conduits individually communicating with said additive and diluent supply containers and said first mixing zone, for transferring individual liquid streams of said diluent and said additive from each of their respective supply containers to said first continuous mixing zone;

(d) a second continuous turbulent liquid mixing zone;

(e) a transfer conduit communicating with said first and second mixing zones for transferring the discharge stream from said first mixing zone to said second mixing zone;

(f) a third conduit communicating with said asphalt container and said second mixing zone for transferring an individual liquid stream of said asphalt base from its supply container to said second mixing zone;

(g) each of said first, second, and third conduits provided wtih means for continuously transferring said individual liquid streams in preselected proportions from their respective containers to their respective mixing zones, said means comprising pump means, pressure flow rate control means downstream of said pump means, and valve means in cooperation with each pump means for maintaining inlet pressure of the liquid stream to each control means greater than the pressure of the liquid being delivered from said control means to said first and second mixing zones; and

(h) discharge means for removing said product from said second mixing zone, said means including a third continuous turbulent liquid mixing zone, dispensing means downstream of said third mixing zone, and a conduit connecting said second and third mixing zones and said dispensing means.

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