June 17, 1952 O. R. SMITH 2,600,932

MIXING DEVICE

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Fig. 1

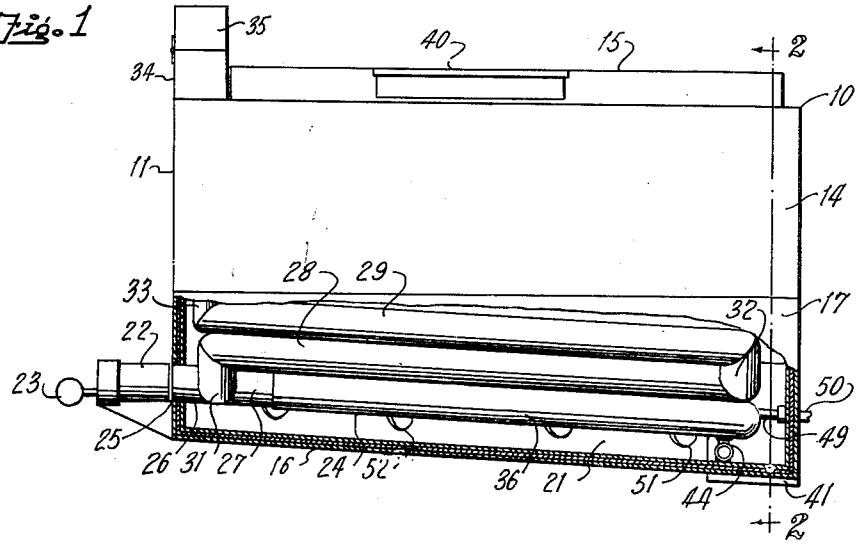
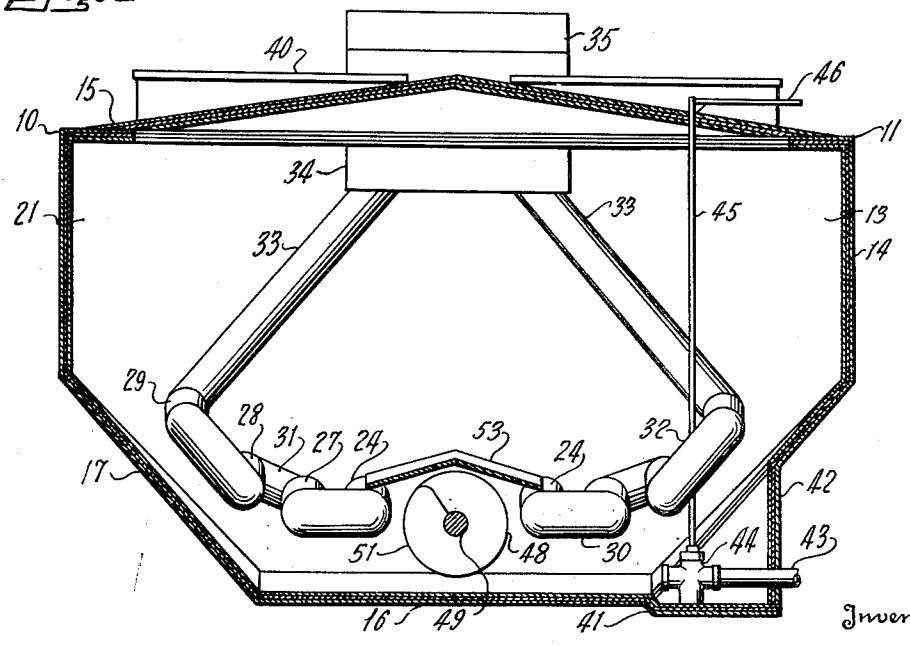


Fig. 2



Inventor

Oliver Ross Smith

By Ashley & Ashley

Attorneys

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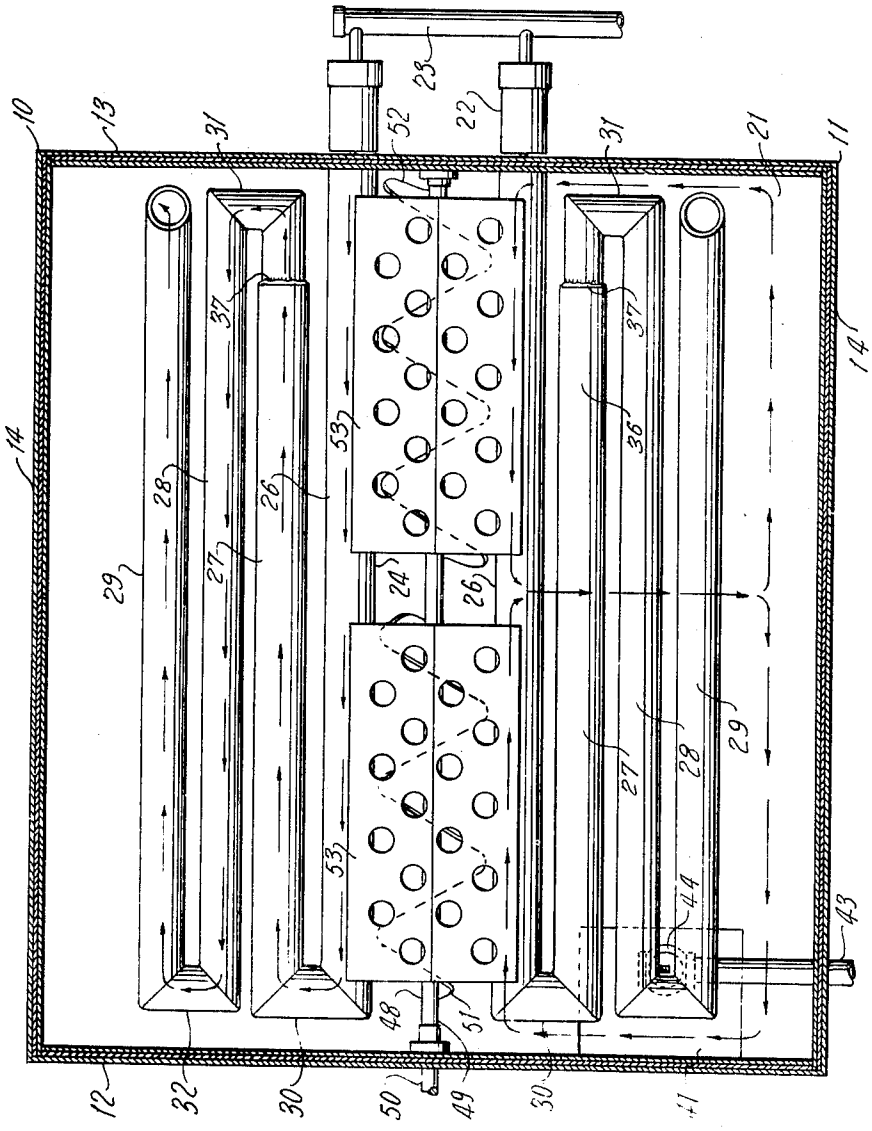


Fig. 3

Inventor
Oliver Ross Smith

By Ashley & Ashley

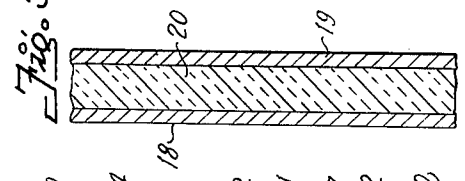
Attorneys

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MIXING DEVICE

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Fig. 5



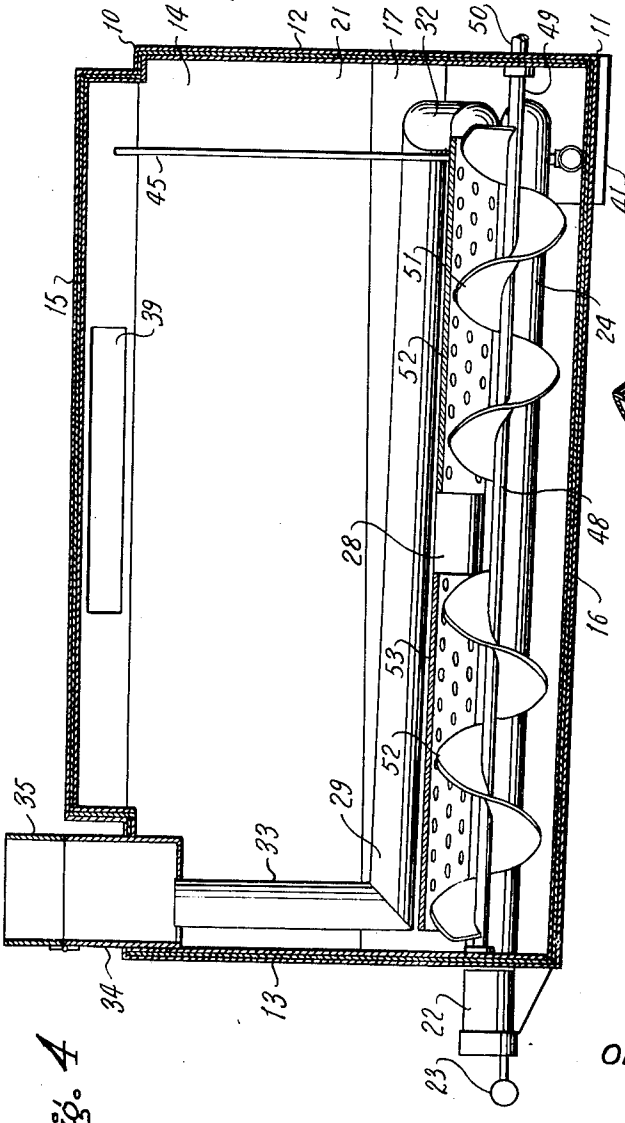


Fig. 4

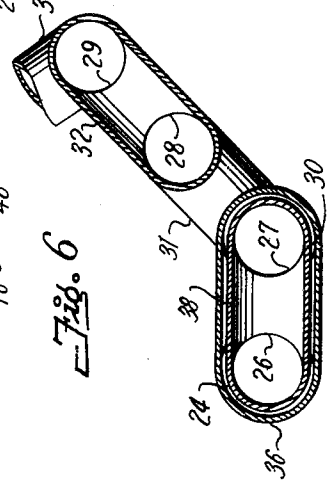


Fig. 6

Inventor
Oliver Ross Smith

By Ashley & Ashley

Attorneys

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2,600,932

UNITED STATES PATENT OFFICE

2,600,932

MIXING DEVICE

Oliver Ross Smith, Fort Worth, Tex.

Application October 20, 1948, Serial No. 55,565

4 Claims. (Cl. 126—343.5)

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This invention relates to new and useful improvements in mixing devices.

One object of the invention is to provide an improved device for efficaciously mixing and simultaneously heating paint, asphalt, pitch, tar, road oil and other materials.

Another object of the invention is to provide an improved mixing device having novel heating means which includes one or more conductors extending through its mixing chamber for circulating the products of combustion through the material being mixed whereby a maximum heat transfer is had.

A particular object of the invention is to provide an improved mixing device, of the character described, wherein the heat conductor preferably has a plurality of longitudinal portions connected by return bends to form a circuitous passage for the products of combustion so as to prolong the latter in heat exchange relation with the material being mixed.

An important object of the invention is to provide an improved mixing device, of the character described, wherein the heat conductor has a heat-insulating jacket, which is preferably disposed in spaced, surrounding relation to prevent burning of the material as well as coking or charring of the same upon said conductor.

A further object of the invention is to provide an improved mixing device having an agitator of such construction that the material being mixed is constantly circulated for obtaining even heat distribution and for preventing the coking or charring of said material.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, wherein an example of the invention is shown, and wherein:

Fig. 1 is a side elevation, partly in section, of a mixing device constructed in accordance with the invention,

Fig. 2 is a transverse, vertical, sectional view, taken substantially on the line 2—2 of Fig. 1,

Fig. 3 is a horizontal, cross-sectional view of the device,

Fig. 4 is a longitudinal, sectional view of the device,

Fig. 5 is a transverse, sectional view of one of the walls of the device, and

Fig. 6 is a sectional view of one of the return bends of one of the heat conductors.

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This application is a continuation in part of my co-pending application filed April 19, 1948, Serial No. 21,981, now Patent 2,565,826, August 28, 1951.

In the drawings, the numeral 10 designates an agitating or mixing device which includes an enclosed, substantially rectangular body or housing 11 having upright end walls 12 and 13, upright side walls 14, a top 15 and an inclined, flat bottom 16. Upwardly and outwardly inclined walls 17 connect the lower portion of the side walls 14 to the bottom 16 which is of less width than the top 15 (Fig. 2). Although not illustrated, the housing 11 may be mounted upon any suitable support and may be placed upon skids or a mobile vehicle (not shown) so as to be readily portable. It is noted that the walls, including the top and bottom, of the housing are of double thickness and that each has a pair of metallic plates 18 and 19 which are preferably spaced by suitable insulation 20 as shown in Fig. 5.

The interior of the housing provides an agitating vessel of mixing chamber 21 which has suitable burners 22 communicating with the rear lower portion thereof through the rear end wall 13. Fuel is supplied to the burners 22 by a line or pipe 23. The burners are disposed in spaced relation adjacent the medial portion of the chamber 21 and a cylindrical heat exchanging tube or conductor 24 communicates with the inner end of each burner, the ends of the conductors being mounted in openings 25 formed in the rear end wall 13. Each conductor 24 extends longitudinally of the mixing chamber to a point adjacent the forward end wall 12 and may have a plurality of parallel convolutions which include straight pipes or tubes 26, 27, 28 and 29 connected by return bends or elbows 30, 31, and 32. An upwardly-directed flue or tube 33 establishes communication between the free end of each tube 29 and an exhaust stack 34 which extends through the top 15 adjacent the rear wall 13. The exhaust stack 34 has a hinged, downwardly-foldable, upper portion 35.

For insulating the conductors 24 from the material within the mixing chamber, a jacket or sleeve 36 concentrically surrounds each conductor in spaced relation. Although the length of each jacket 36 is subject to variation, the same extends at least from the rear end of the tube 26, around the first bend 30 and substantially throughout the length of the first return tube 27. The ends of the jacket are closed by welding or other suitable means as shown by the

numeral 37 so as to provide an annular, dead-air space 38 between each conductor and its jacket as shown in Fig. 6. Manifestly, this dead-air space permits the transfer of heat from the conductors to the material in the chamber, while preventing burning of said material as well as coking or charring of the same upon said conductors. It is unnecessary for the jackets to extend throughout the length of the conductors, because the heat of the products of combustion is dissipated sufficiently by the time said products reach the exposed portions of said conductors to prevent excessive heating of said portions. However, the exposed portions of the conductors are heated to an extent and part of this heat is transferred to the material in the chamber.

A pair of externally-flanged, rectangular openings 39 are formed in the medial portion of the top 15 of the housing in transverse alinement for permitting the introduction of the material to be mixed into the chamber. Each opening 39 is closed by a complementary hatch or lid 40. It is noted that the housing bottom 15 is inclined downwardly toward its forward end and that a sump 41 communicates with the forward lower portion of the chamber. The sump 41 is preferably disposed at one side of the chamber, being formed by a lateral box-like projection 42, and has a discharge pipe 43 communicating therewith through a manual control valve 44. For opening the valve 44, a stem or rod 45 projects upwardly through the housing top 15 and has a handle or lever 46 mounted on its upper end. Due to the inclination of the chamber bottom, the material in the chamber drains toward the sump.

For admixing the material, which may be in the nature of paint, asphalt, tar, pitch, or road oil, an agitator 48 extends longitudinally of the chamber between the conductors 24. The agitator 48 includes a shaft 49 having its ends journaled in the end walls 12 and 13 of the housing. As shown by the numeral 50, the forward end of the shaft projects through the end wall 12 so as to permit driving of said shaft. A sectional blade or a plurality of blades 51 are mounted on the forward portion of the shaft and are arranged in a continuous left-hand flight or spiral as shown in Fig. 4. The rear portion of the agitator shaft carries a reverse or right-hand continuous flight or spiral formed by a similar sectional blade or blades 52. Due to this arrangement, rotation of the agitator in a clockwise direction (Fig. 2) causes the material in the chamber to travel toward its center. The opposite spirals or helical paths of the blades 51 and 52 produce the effect of separate screw conveyors. For protecting the agitator blades and confining the conveying action of the same so as to cause circulation of the material in definite paths, a perforated or foraminous hood or cover 53 overlies each blade and preferably rests upon the jackets 36 as shown in Fig. 2. The hoods 53 are readily removable for cleaning purposes and, due to their perforations, do not interfere with normal heat transfer. Also, the perforations permit limited transverse movement of the material.

In operation, the material to be mixed and/or reduced to a fluid condition is introduced into the mixing chamber through one of the openings 39. Due to the left-hand spiral of the sectional blade 51 and the right-hand spiral of the sectional blade 52, the material in the ends of the chamber is drawn toward the center thereof and travels longitudinally of the blades within the hood 53. Upon reaching the inner ends of the blades, the material passes laterally toward the sides of the chamber between the hood and flows longitudinally along said sides toward the ends of said chamber so as to be drawn into the outer ends of said hood by said blades. Thus, the material is forced to travel through a plurality of oval paths as shown by the arrows in Fig. 3.

Manifestly, the hood facilitates the circulation of the material by more sharply defining the paths thereof. Due to the inclination of the chamber bottom, material is constantly furnished to the sump 41 without interfering with the circulation of said material. Whenever desired, the mixed material may be discharged through the pipe 43 by turning the lever 46 so as to open the valve 44. The material is heated to the desired temperature and maintained at such temperature by the conductors 24. Since the conductors are insulated as are the housing walls, there is substantially no coking or charring of the material and cleaning of the chamber is seldom required. Due to the circulation of the material, it is manifest that a minimum quantity of heat is required and that the material is mixed to a substantially uniform consistency.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. In a mixing device having a mixing chamber, a heat exchanger including, a burner, a heat exchanging conductor in the chamber and having a tube communicating with the burner for receiving the products of combustion therefrom, and a jacket surrounding in spaced relation the portion of the tube adjacent said burner to conserve the heat of the products of combustion and distribute such heat substantially throughout the length of the conductor.

2. A mixing device as set forth in claim 1 wherein the jacket extends substantially one-half the length of the tube and has its ends closed to provide a dead-air insulating space therebetween.

3. A mixing device including, a mixing chamber, a pair of burners, a pair of spaced heat exchanging conductors extending longitudinally through the chamber in communication with the burners for receiving the products of combustion therefrom, a screw-type agitator extending longitudinally in said chamber between the conductors for creating longitudinal circulation in intimate contact with said conductors, each heat exchanging conductor including a plurality of longitudinal tubes connected by return bends and disposed in transversely spaced relation adjacent the bottom of the chamber and laterally of the agitator for conducting the products of combustion through a circuitous path in the lower portion of said chamber and distributing the heat thereof throughout the chamber, and heat insulating means surrounding the portion of each conductor adjacent the burner and agitator to conserve the heat of the products of combustion and distribute such heat substantially throughout the length of said conductor.

4. A mixing device including, a mixing chamber, a pair of burners, a pair of spaced heat exchanging conductors extending longitudinally

through the chamber in communication with the burners for receiving the products of combustion therefrom, a screw-type agitator extending longitudinally in said chamber between the conductors for creating longitudinal circulation in intimate contact with said conductors, and heat insulating means surrounding the portion of each conductor adjacent the burner and agitator to conserve the heat of the products of combustion and distribute such heat substantially through the length of said conductor.

OLIVER ROSS SMITH.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
277,277	Healey	May 8, 1883
546,708	Pierce	Sept. 9, 1895
1,021,781	Kingsley	Apr. 2, 1912
1,218,895	Porter	Mar. 13, 1917
1,368,284	Oslie	Feb. 15, 1921
1,389,637	Field	Sept. 6, 1921
1,560,826	Kirschbraun	Nov. 10, 1925
1,579,193	Chipman	Mar. 30, 1926
1,689,551	Hammond	Oct. 30, 1928
1,810,637	Beers	June 16, 1931
1,896,616	Gillican	Feb. 2, 1933
2,076,780	Haupt	Apr. 13, 1937
2,367,149	Smith	Jan. 9, 1945
2,379,155	Huff	June 26, 1945