June 18, 1963 C. C. FIGGE 3,093,936

ROOFING APPARATUS

Filed Feb. 12, 1957

FIG. 1

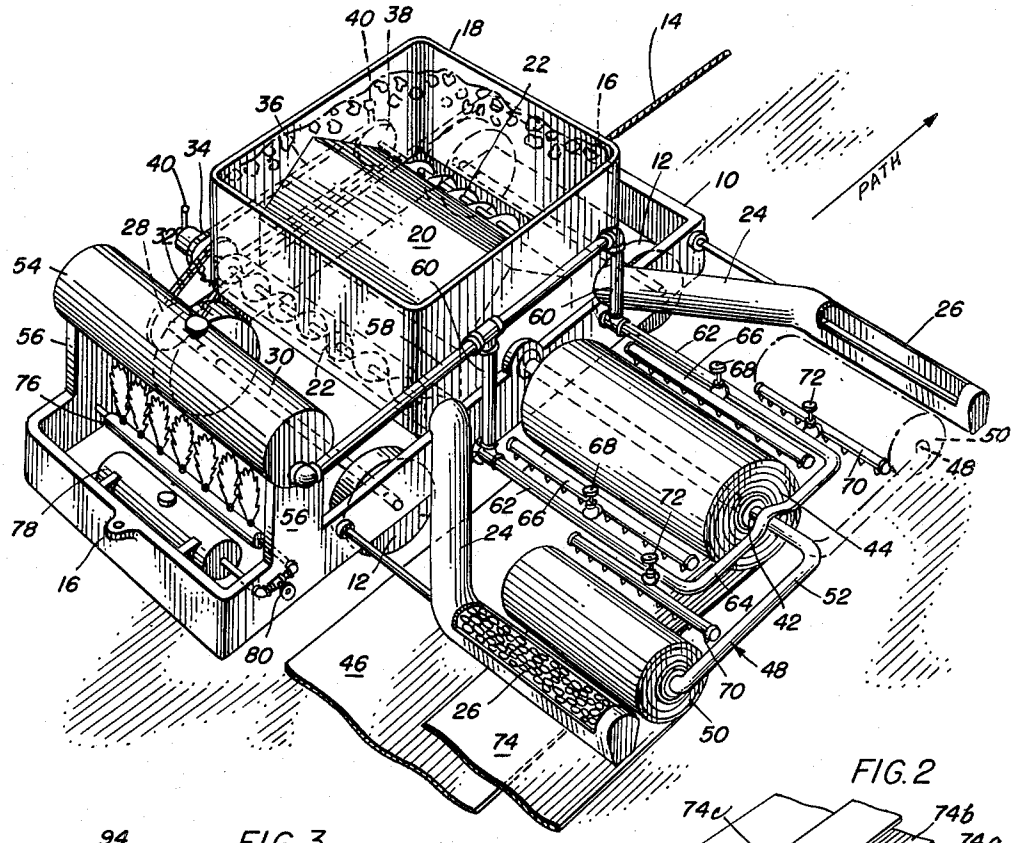


FIG. 2

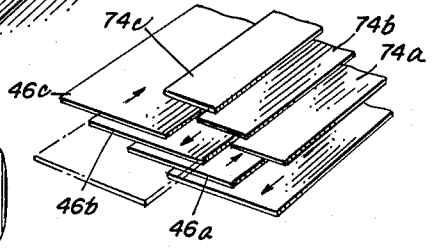
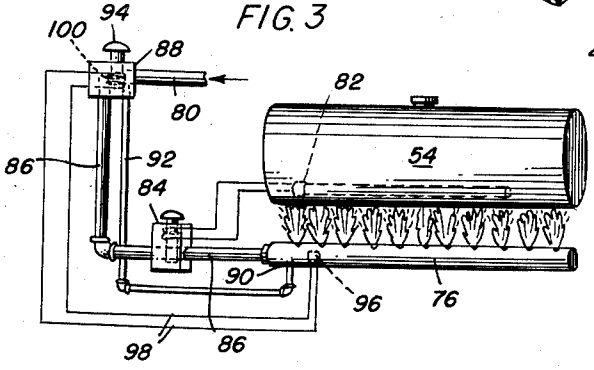


FIG. 3



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ROOFING APPARATUS

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This invention relates to a new and improved method and apparatus for simultaneously applying a layer of roofing material and for sealing and finishing the lap edge of this layer at the same time. The invention comprises the operation of applying a bituminous top coating or such a coating with mineral surfacing, cementing a layer of bituminous roofing material in place, coating one side or both sides of a cellulose glass or asbestos fiber felt, or a plastic film in place on a roof. The top surface of these layers may be coated with bituminous material either hot or cold, with or without mineral aggregate, or with a thin sheet of metal such as aluminum copper, zinc or lead. This may be done with adhesive or protective materials requiring heat to liquify them, or a cold liquid or plastic cement either hot or cold may be applied.

An important object of the invention is to provide an apparatus for carrying out this method and operation which may be moved back and forth over a roof in applying successive layers without turning the machine around at each end, simply reversing the motion of the machine, severing the layers being applied, and moving the machine to a new path to apply a new layer or layers.

A further object of the invention is to provide an apparatus which is operated on the roof surface adjacent the last laid layer with laterally projecting apparatus which is supported on the roof itself and not upon the finished roofing layers which have been applied.

A further object of the invention is to provide a machine and a method for laying a layer of roofing at one side of a wheeled carrier which has reversible means for applying a protecting layer over the exposed lap edge of a roofing layer applied concurrently therewith.

Still a further object of the invention is to provide a method and apparatus for applying a roofing layer, a sealing sheet and a mineral cover aggregate in either direction of operation of the apparatus over a roof without reversing the carrier of the apparatus but only one or more of the elements thereof.

A further object of the invention is to provide a method and apparatus for substituting a sealing sheet in the place of a mineral aggregate cover or in applying a mineral aggregate cover in addition to the sealing sheet if desired.

Other objects of the invention will appear in the specification and will be apparent from the accompanying drawings in which:

FIG. 1 is a perspective view of a reversible roofing apparatus in accordance with the method of this invention;

FIG. 2 is a somewhat diagrammatic transverse sectional view of a three layer overlapping roof structure and a corresponding sealing sheet structure therefor as laid concurrently with the roofing sheets providing a finished roofing in accordance with the present invention; and

FIG. 3 is a somewhat diagrammatic view illustrating a thermostatic control for heating a bituminous liquid carrier as shown in the apparatus of FIG. 1.

By this method and apparatus, a sealing strip is applied to the exposed edge of a roofing felt layer as it is added in overlapping relation to another similar roofing layer and a sealing strip of a roofing installation thereby installing a completed roofing without running the apparatus over a finished portion of the roofing.

By moving the apparatus back and forth over the roof as each successive layer is applied without turning the apparatus around, but simply reversing its movement, a

new and improved method of laying a finished roof is thus provided. The sealing strip may be cemented in place by a hot or cold waterproofing liquid or by a plastic if desired, a mineral aggregate covering may be applied in connection to or in place of the sealing strip.

Referring now more particularly to the drawing, the apparatus comprises an open frame **10** mounted on wheels **12** and adapted to be moved back and forth by a motor (not shown) or by pulling it in either direction by means of a cable **14** which may be attached to eye **16** at either end of the frame.

Centrally of the frame **10** is a hopper **18** for gravel or other mineral aggregate having a central inclined divider **20** for directing the material to the front and rear of the hopper and located at the bottom of the front and rear portions of the hopper are spiral conveyors **22** communicating with external distributor pipes **24** at one side of the hopper and projecting from the frame **10** each having an outer horizontal discharge portion **26**.

One set of opposite wheels **12** may be moved in a manner for steering. Each conveyor **22** may be separately operated by means of a driving pulley **28** mounted on a driving wheel shaft **30** connected to opposite wheels **12** which act as drivers. The driving pulley is connected by a belt or a sprocket chain **32** with a rotatable head **34** mounted at one end of one of the spiral conveyors **22** and connected to the other spiral conveyor by a belt or sprocket chain **36** with a driving pulley on the other spiral conveyor **22**. A clutch comprising an operating handle **40** is connected to the shaft of each spiral conveyor and either one may be connected to the driving head **34** or the driving pulley **38** depending upon which handle is operated.

The distributor pipes **24** for the mineral aggregate extend downwardly and outwardly from the hopper to discharge the mineral aggregate close to the level of the roof upon which the apparatus is moved and the pipes are angled forwardly and rearwardly to provide a space for other portions of the apparatus between the lateral extensions of the pipes.

Extending centrally between the distributor pipes **24** and at the same side of the frame **10** is a supporting shaft **42** for a main roll **44** of roofing material which is rotatably mounted thereon for discharging a strip or layer **46** of roofing material. At the outer end of this shaft **42** is a reversely bent extremity **48** spaced from the shaft **42** and providing a support for a sealing material roll **50** which is properly spaced from the main roll **44** by an offsetting shaft portion **52**. This roll **50** may be positioned at either side of the main roll by rotating it from the trailing position as shown in FIG. 1 to the opposite broken line position as shown therein, depending upon the direction of movement of the apparatus over a roof surface and the desired application of the sealing material rolled. If the entire apparatus is moved in one direction while material is being applied from the main and sealing rolls, the web of material on the rolls must be severed and the position of the sealing material roll must be changed to move the apparatus for properly applying the rolling and sealing material in a new path in the other direction.

Also projecting laterally from the frame **10** is a system of piping for distributing liquid bituminous adhesive or roof covering material from a supply tank **54** preferably mounted above the main portion of the frame **10** by supports **56** and having a main distributing pipe **58** leading from the tank **54** with vertical supply pipes **60** leading downwardly therefrom to a horizontal distributing pipe **62** which may have separate branches at opposite sides of the main roll **44** or the ends of these branches may be joined by a curved portion **64** which extends beyond the outer end of the main roll **44** either above or below the offsetting shaft portion **52** for the sealing material

roll **50** which will not be affected in the forward or rearward turning movement of the reversely bent extremity **48** which supports the sealing material roll **50**.

Extending inwardly from each branch of the horizontal distributing pipe **62** is a perforated distributing pipe **66** substantially of the same length as the main roll **44** and parallel thereto to distribute adhesive or bituminous liquid in advance of the main roll depending upon the direction of movement of the apparatus over the roof. Each distributor pipe **66** is connected centrally or intermediate its length to the adjacent horizontal distributor pipe **62** through a valve connection **68** so that either one or the other, or both of the distributor pipes **66** may discharge liquid therefrom. Usually one valve connection is open and the other is closed depending upon the direction of application of the main roll **44**.

At the outer side of each horizontal distributing pipe **62** is a perforated distributing pipe **70** for the sealing material roll **50** depending upon its position at one side or the other of the main roll and the direction of movement of the apparatus. Each of these distributor pipes **70** is likewise individually controlled by a valve connection **72** between it and the main horizontal distributing pipe **62**. The length of the distributing pipe **70** are of sufficient length to accommodate the longest sealing material roll **50** which may be ordinarily used in connection with the main roll **44** depending upon the number of plies in the roof, the amount of overlap, the kind of sealing material and whether a mineral aggregate is discharged from the aggregate distributor pipe **24** which also projects from the frame **10**.

With this construction, a roofing or layer **46** of full width may be applied to a roof entirely free from and at one side of the wheel mounted frame **10** with the wheels operating free from contact with the roofing and on that portion of the roof not yet covered by the applied layers. At the same time, a width of sealing material **74** may be applied over the edge of the roofing layer **46** most remote from the operating frame. In a movement of the apparatus to the right as indicated in FIG. 1, the main roll **44** will receive adhesive below it from the perforated distributing pipe **66** in advance of the main roll, the sealing material roll will follow on top of the edge of the ply or layer **46** and it will receive adhesive or bituminous material below the sealing material layer **74** and on top of the roofing layer **46** from its perforated distributing pipe **70**.

At the end of the application of the layer **46** and the strip of sealing material, the open valve connections are closed, the strips of materials are severed, the sealing material roll **50** is rotated to the opposite side of the main roll **44**, the machine frame **10** is moved away from the layer **46** just applied an amount equal to the overlap of the strips or layers **46**, the liquid adhesive valve connections **68** and **72** are opened and the machine is moved in the reverse direction without turning it around, simply moving it back out of contact with the layer or layers which it is applying, laterally from the supporting frame **10**.

If successive layers are applied to a roof insulation as illustrated in FIG. 2, roofing layers **46***a*, **46***b* and **56***c* for example, are laid in overlapping relation and in succession, and at the same time each layer is applied a corresponding sealing strip **74***a*, **74***b* and **74***c* is laid over the overlapping edge of its corresponding roof layer and may also overlap the adjacent edge of the preceding sealing strip **74***b* or **74***a* as shown. In applying the sucsessive layers and strips, the roof layer **46***a* and its sealing strip **74***a* are applied in one direction of movement of the apparatus as indicated by the arrow, the roof layer **46***b* and its sealing strip **74***b* are applied in overlapping relation in the reverse direction of movement of the machine as indicated by the arrow, and the final layer **46***c* with its sealing strip **74***c* is laid by the operating apparatus moving in the opposite direction as indicated by the arrow.

In this manner of operation and application of the layers, the layers are sealed and the roof is completed up to the application of the last lap by the apparatus; it is unnecessary to go over the applied portion of the roofing with another layer and even if the work is interrupted, no harm from rain or weather will come to the portion of the roofing which has been applied because it will be complete and finished as it is laid.

The sealing or adhesive liquid in the supply tank **54** may be hot or cold and it may be kept at a suitable flowing or applying temperature by means of a burner **76** receiving fuel from a tank **78** supported at one end of the frame **10** and connected to the burner by a manual shut-off valve connection **80**. The burner is below the tank **54** and in addition to the manual shut-off, there is an automatic control as shown in FIG. 3 including a thermal-couple **82** in the tank **54** connected to a valve **84** for controlling the actual supply of fuel to the burner **76** depending upon the heated condition of the material in the tank. The pipe **86** extends through the valve **84** and to a starting valve **88** and thence by way of the valved connection **80** as shown in FIG. 1 to the source of fuel supply. A pilot light **90** is maintained in the burner **76** by a piped connection **92** from the starting valve **88** whenever the valve connection **80** is open. This valve normally has an operating plunger **94** which is pushed downwardly to start the flow of fuel through the valve **84** to the burner and the valve is magnetically maintained in its open condition by a thermal-couple **96** located in the burner **67** and having conductors **98** extending to a thermal-holding coil **100** in the starting valve **88**.

The operation of this heating arrangement is that the manual valve connection **80** is first opened, supplying fuel to the starting valve **88**, the operating plunger is depressed, the pilot light **90** is lighted if not already in operation, and if the tank **54** calls for heat through the thermal-couple **82**, the valve **84** is opened and the burner is ignited by the pilot light **90**. If the burner is extinguished for any reason, the thermal-couple **96** de-energizes the holding coil **100** through the conductors **98**, releasing the plunger **94** and shutting off the main supply of fuel to the burner. The thermal-couple **82** is an operating connection for maintaining a substantially uniform or a desired heat in the tank **54** by varying the supply of fuel through the valve **84** to the burners **76**.

This heating apparatus is substantially automatic once it has been adjusted and set for operation with any particular adhesive or liquid. It may need adjustment for accommodating any other liquid. For some liquids used for adhesives or for a covering liquid, it may not be necessary to heat them as they are adapted for cold application. In this case, the heating apparatus is simply disconnected.

The thermal-couples develop a sufficient electrical flow to vary the fuel supply through the valve **84** and for closing the plunger by means of the holding coil **100** in the starting valve **88**.

With this method and apparatus, it is possible to apply a single layer or a succession of overlapping layers by operating the apparatus back and forth and out of contact with the layers already applied; to apply a sealing strip over the edge of the last layer applied which may also overlap a portion of the preceding layer and the edge of the preceding strip as shown in FIG. 2; the sealing strip may be omitted and the sealing liquid may be applied in its place; and an adhesive coating may be applied in the path of the sealing roll and a layer of mineral aggregate may be distributed adhering to the adhesive.

The adhesive or coating liquid may be applied cold, or it may be heated and applied separately and in conjunction with the sealing strip or with the mineral aggregate.

As thus presented, a variety of operations and applications of material are shown and described, the apparatus is at all times free from contact with the finished portion of the roofing, and the direction of movement of the apparatus is reversed without requiring it to be turned around.

An advantage of this operation is that the roofing operation is completed up to the last layer applied by the apparatus and no further operations are required to finish that portion of the roofing which has already been applied.

While I have thus described a preferred form of my method and apparatus, it should be regarded by way of illustration and example rather than as a restriction or limitation of the invention as various changes may be made in the construction, combination and arrangement of the parts without departing from the spirit and scope of the invention.

I claim:

1. In a roofing apparatus, a wheeled carrier movable back and forth in spaced parallel paths for laying from one side lapped plies of roofing material without reversing the carrier, means supporting a roll of roofing material from said one side and projecting laterally outwardly therefrom with the axis of said roll substantially perpendicular to said one side, swingable means supporting a roll of sealing material from said one side and projecting outwardly beyond the first named supporting means with the axis of the second named roll parallel to the axis of said first named roll, said latter supporting means positioning the roll of sealing material with its innermost terminal edge inwardly of the outermost terminal edge of the roofing material and the outermost terminal edge of the sealing material outwardly of said outermost terminal edge of the roofing material for providing an overlap of said two materials when unrolled and said swingable supporting means movable about an axis to shift the roll of sealing material to either of two opposite sides of the first named roll thereby having the second named roll trail the first named roll while maintaining the parallel relationship of the axes of the rolls as the carrier moves in said paths.

2. A roofing apparatus as claimed in claim 1 and including adhesive and bituminous liquid supply means, and distributing means on the carrier for applying said adhesive and bituminous liquid including liquid dispensing means between the two rolls with the second named roll positioned on either of said two sides, said dispensing

means positioned transversely of the overlap of the two rolls to apply the liquid onto the unrolled surface of the roofing material prior to its being overlapped by the unrolling of said sealing material.

3. A roofing apparatus as claimed in claim 2 wherein said liquid supply means includes a supply tank for said liquid, and heating control means for controlling the temperature of said liquid in said tank.

4. A roofing apparatus as set forth in claim 2 including mineral aggregate supply means and discharging means on said carrier for discharging said aggregate from said mineral aggregate supply means, said discharging means including a discharge tube positioned on each side of said first named roll for discharging said aggregate onto the upper surface of said sealing material in either direction of travel of said carrier.

5. A roofing apparatus as claimed in claim 2 wherein said dispensing means extends beyond said overlap to apply said liquid across the entire path of said sealing material.

6. A roofing apparatus as claimed in claim 5 wherein said distributing means includes second dispensing means for distributing said liquid across substantially the entire path of siad roofing material on either of said two opposite sides of said first named roll.

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