May 10, 1966 T. C. POTTS 3,250,191

MACHINERY FOR THE MAKING OF ROADS AND THE LIKE

Filed Dec. 26, 1962 3 Sheets-Sheet 1

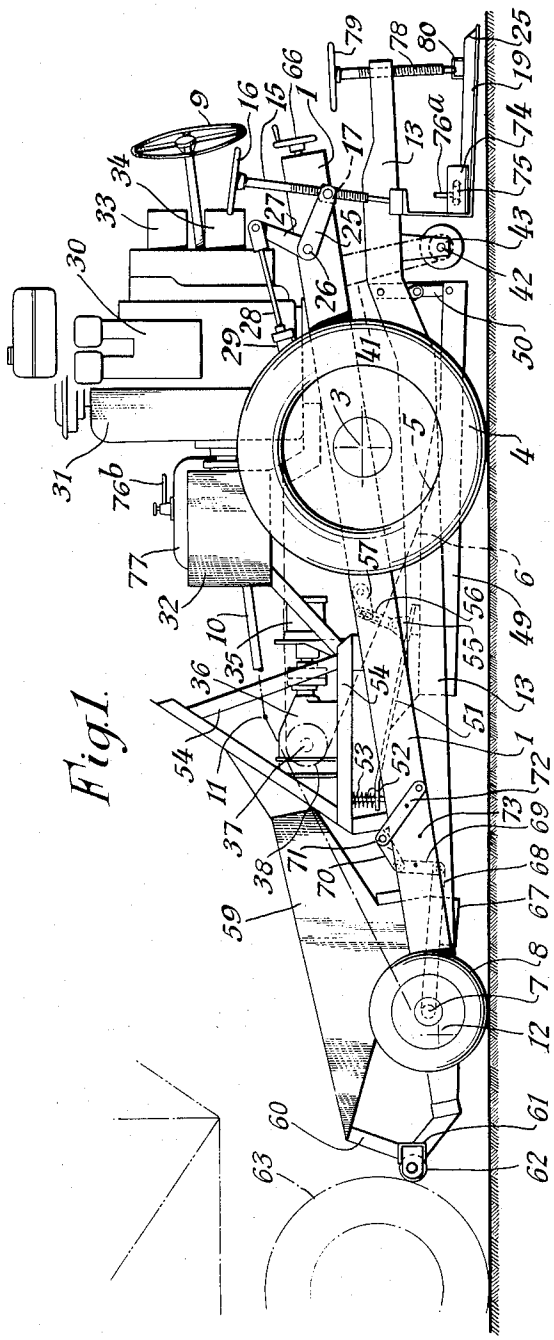


Fig. 1.

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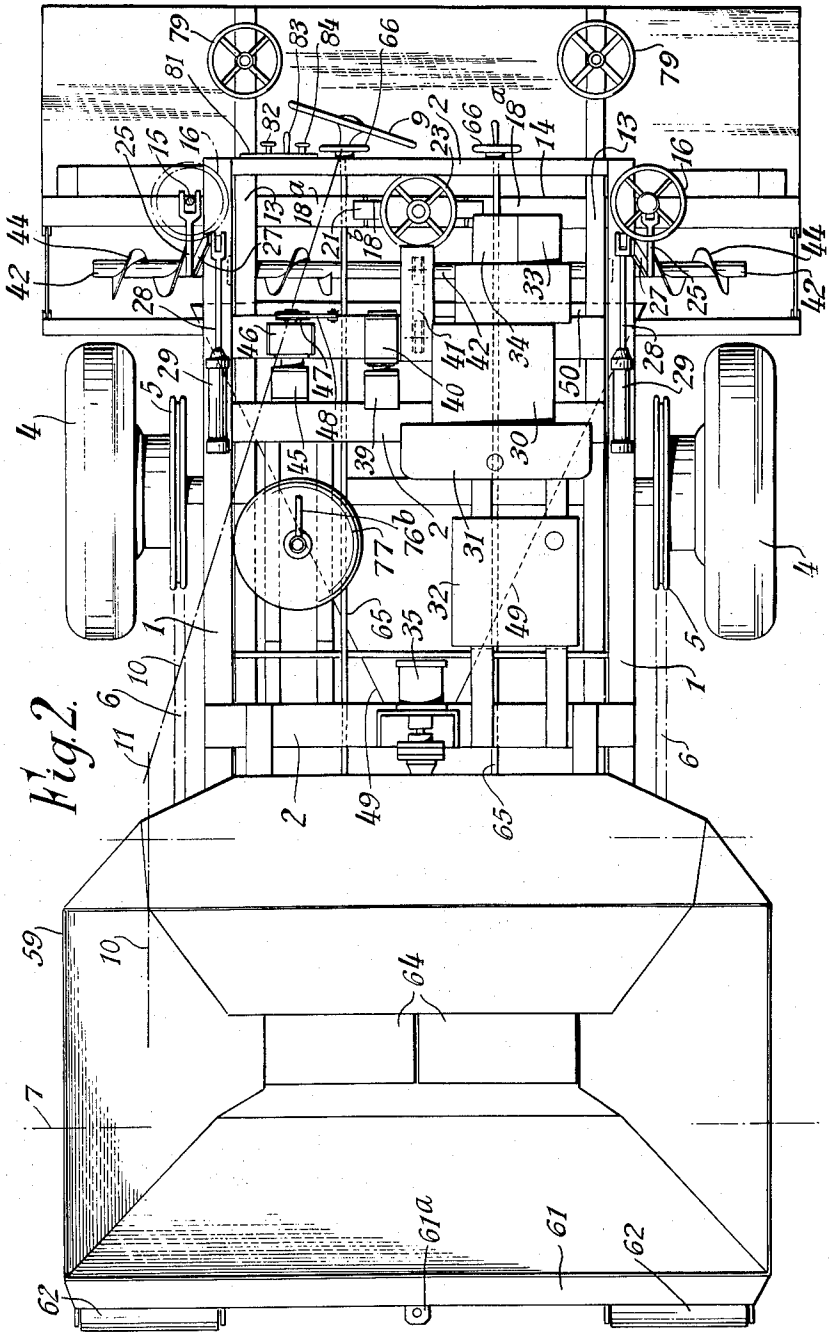


Fig. 2.

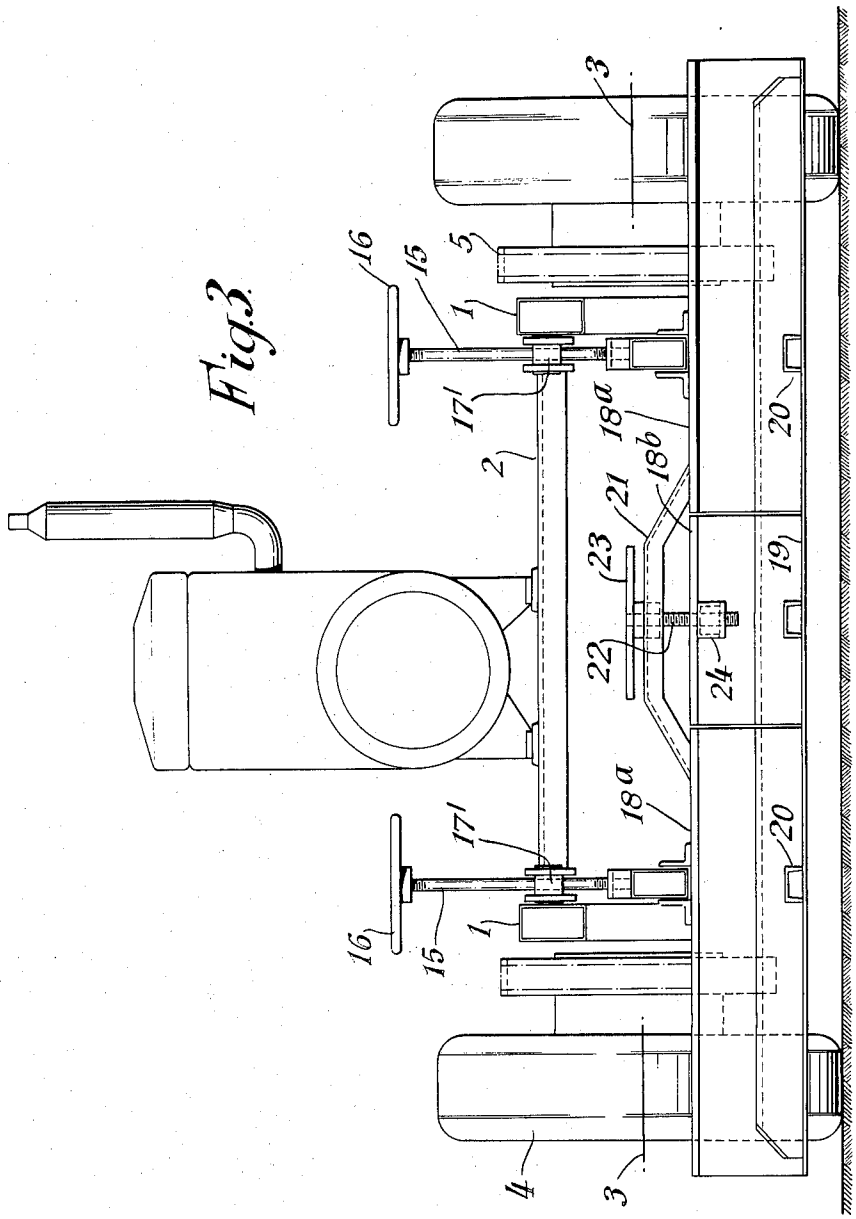
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Fig.3



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MACHINERY FOR THE MAKING OF ROADS AND THE LIKE

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10 Claims. (Cl. 94—46)

This invention is concerned with a machine whose main use will be for the laying and surfacing of roads, paths and the like, but which is useful also for the laying of larger areas such as car parks, airport runways and similar traffic surfaces. The primary purpose of the invention is for the laying of bitumenised or tarred ballast, such as that known by the trademark "Tarmac," and whether of course, medium or fine grade. The improved machine could however be used also for the laying of other wet mixtures, such as concrete and similar spreadable, hardenable materials.

It is one of the main objects of the present invention to provide an efficient and sturdy apparatus which is very much less costly than those hitherto obtainable, which is easy to operate, is easy to clean after use, and is readily convertible from actual working conditions to a condition for transit under its own power between various places of operation and/or storage.

According to this invention, the improved spreading apparatus comprises a wheeled chassis carrying at its front end a hopper for the material to be spread, and a sub-frame pivotably mounted in said chassis at or near such front end and having at its rear end a transverse screed and a spreader plate extending across the track of the vehicle, means for moving said sub-frame about its pivot so as to regulate the height of the said screed from the ground, and further means for adjusting the inclination of the spreader plate between its front and rear edges so as to determine the final thickness of the layer being spread. The apparatus will usually be self driven, e.g. by internal combustion engine but in some cases could be towed.

The invention may be characterised by the provision of a plow device suspended from the sub-frame usually in the form of a triangle arranged apex foremost and pivotably supported about a vertical axis at the apex and means would be provided for oscillating the plow horizontally about a point at or near said apex so as to spread laterally the material encountered by the plow after falling from the hopper. In order to assist in the lateral spreading of the material a rotary screw is arranged on a transverse axis at each side of the machine immediately in front of the screed and means is provided for rotating these screws when their rotation is necessary or desirable.

In order that the machine may be usable in all weather conditions it is proposed to provide a heating means on the spreader plate, one form of which means could be an arrangement of burners for a combustible gas (e.g. butane or methone) delivered to the burners from a pressure vessel carried on the machine.

In the preferred arrangements the vehicle is provided with a power unit adapted to drive a number of hydraulic pumps feeding a corresponding number of hydraulic motors, one for the driving of the machine along the road, via a differential gear, one for oscillating the plow and one for driving the said screws. The drive to the road wheels could be through a reduction gear for slow movement whilst spreading, and where traffic regulations so allow, through a higher ratio speed transmission for more rapid movement whilst being transported from place to place.

The machine may include a roller at the back, to roll out the spread material, and in those cases steering of the machine may be effected by shifting the axis of the roller, and the drive transmission to the road wheels will include a reversing gear. In most cases however it will be more convenient to have an independent roller following behind the machine and, in these cases steering of the machine will be effected at the front wheels, for example through an Ackerman type steering mechanism.

Th machine will usually have pneumatic-tired wheels, the rear wheels being the larger and being driven.

According to a further feature of the invention, the said spreader plate is mounted on the lower end of the screed and such screed is divided into end to end sections one or more of which is or are adjustable in height so as to impart a camber to the spreader plate. This adjustment and the adjustment of the sub-frame in the main frame makes it possible to vary the spreader plate so that it may be (a) straight and parallel with the road surface being covered or (b) straight and inclined to the road surface being covered, or (c) cambered, either symmetrically or asymmetrically across the road surface.

Conveniently the said sub-frame is pivoted to the chassis adjacent the axis of the front wheels, it carries the screed at its rear end and such rear end is suspended from the chassis by screw-and-nut mechanism by which the sub-frame may be wound up close to the main chassis when not in use. There is also a further nut-and-screw mechanism operating between the said sub-frame (or an extension thereof) and the rear part of the spreader plate, for altering the inclination of the spreader plate relative to the longitudinal axis of the machine, by lifting or lowering the free edge of the plate, thereby determining the thickness of the layer being spread.

The invention will now be described with reference to the accompanying drawings of one practical embodiment. In the drawing:

FIG. 1 is a side view of the machine in working condition;

FIG. 2 is a plan of the same; and

FIG. 3 is a rear view of a slightly modified form of the machine.

As shown the improved spreader comprises a main chassis, made up of longitudinal girders **1** which are inclined upwardly from front to rear and are braced together by transverse girders or angles **2**. This main chassis carries mountings for a main axle whose axis is indicated at **3** and on which are the rear wheels **4**, each such wheel being associated with a double chain sprocket **5** to be driven by a chain **6** as hereinafter described. At the front end of such main chassis is a front axle whose axis is indicated at **7** and the ends of which carry smaller non-driven wheels **8**. These wheels would be on stub axles (not shown) controlled for steering purposes by a normal Ackerman type steering mechanism operated from a steering wheel **9** through a steering column **10** articulated at a universal joint **11**.

Pivotally mounted to the forward end of this main chassis at the point **12** is a sub-frame or sub-chassis made up of longitudinal girders **13** braced transversely by angles or plates **14**. The height from the ground of both these frames is fixed at the front end, being determined by the position of the axis of the hinge **12**. At the rear end however, whilst the height of the main chassis is fixed being determined by the wheels **4**, the height of the sub-frame is variable by means of screws **15** equipped with hand wheels **16** and passing through nuts **17** held on the main chassis, the lower ends of these screws **15** having collars which are held captive but rotatable in shackles **18** mounted on the sub-frame. Therefore, by rotating the wheels **16** and elevating screws **15** in the one direction or

other, the rear end of the sub-frame may be raised and lowered, as the case may be.

Carried by the members **13** of the sub-frame is a channel-sectioned screed composed of the three end-to-end parts, namely two outer parts **18a** and a centre part **18b**. These three parts are connected along their lower edges to a common spreader plate **19**, which is reinforced by welded-on channels **20** arranged fore-and-aft of the vehicle. The two end parts **18a** of the said screed are connected together by a bridgepiece **21** through which passes an adjustment screw **22**, with handwheel **23** at the top, and this screw engages in a nut **24** fixed to the centre part **18b** of the screed. By rotation of the screw **22** to raise the part **18b**, the spreader plate **19** may be adjusted, or constrained, to take up a curved or cambered formation transversely of the vehicle. Also by a differential rotation of the adjustment screws **15**, the spreader plate and screed may be given any desired angle to the road surface being covered.

In the preferred forms of the improved machine the nuts **17** are held on one arm **25** of a bell-crank lever pivoted at **26** on the main frame girders **1**, the other arm **27** of these levers being connected to the piston rod **28** of a hydraulic ram drive **29**. Whilst therefore the adjustment screws **15** give a fine adjustment of the plate **19** to a working position, the drive **29** allows of a rapid high lift of the plate, useful for example when the vehicle is to be driven in a non-working condition, say from site to site or site to depot. By having a suitable fixed limit stop in the drive **29**, the plate **19** may be returned to its working position after having been lifted therefrom without requiring any re-adjustment.

In an alternative arrangement, illustrated in FIG. 3, the nuts **17'** are connected directly to the main frame girders **1**. In this case no rapid high lift of the spreader plate is possible.

The machine is powered by an engine indicated in outline at **30** with cooling radiator **31** at the front. This engine drives three hydraulic pumps, namely a main pump in a tank **32**, this pump being directly coupled to the engine at the front thereof, and two pumps **33**, **34** coupled to the engine indirectly at the rear thereof. The pump **32** drives a hydraulic motor **35** direct coupled to the input of a differential gear unit **36** from which transverse axles **37** extend, each of these axles carrying a chain sprocket **38** which by the chains **6** drive the said sprockets **5** on the main axle. The pump **33** drives a hydraulic motor **39** which through a reduction gear **40** and a chain drive **41**, slowly rotates a shaft **42** held in bearings **43** suspended from the sub-frame girders **13**. On the shaft **42** are feed screws **44**, of opposite thread, which have the task of feeding to the outer ends of the spreader any excess of material accumulating at the center of the screed due to a build-up against the screed. The pump **34** drives a hydraulic motor **45** and reduction gear **46**, the output from which last carries an eccentric **47**, the strap rod **48** of which has a purpose described below.

Carried by the sub-frame is a suspended triangular shaped frame or plow comprising inclined sides **49** and a transverse rear part **50**. The forward apex of this plow is suspended by an arm **51** whose forward end is held on a pin **52** carying a compression spring **53** above the arm, the said pin being held in a super-structure **54** built on to the main frame. At its rear end the plow is suspended from the main frame by pivoted links allowing of a transverse to and fro movement, which movement is received from the above mentioned strap-rod **48** of the eccentric **47**, the lower end of such rod being pivotally connected to the transverse member **50** of the plow.

At its forward end portion, the plow has upstanding lugs **55** receiving one end of slotted links **56** which in turn are connected to arms **57** on a cross shaft **58**. By adjusting the connections of these parts the front

end of the plow may be given any desired height so as to vary the degree of inclination of the plow. Should the plow meet an obstruction in the road, the spring **53** will allow it to rise and pass over the obstruction. The triangular frame or plow is adapted for transverse vibration so as to spread material from the hopper in the event of its piling up unduly at the centre of the machine.

The sub-frame may carry lateral extensions (not shown) at the ends of which there would be side plates determining the outside contours of the spread area.

At its front end the main chassis carries a hopper **59** for receiving the material to be spread, this hopper being supported at the front end by struts **60** adjacent the lower end of which are brackets **61** for transverse rollers **62** which may abut against the tires **63** of a truck or the like used for loading material into the hopper. This arrangement allows of the spreader being hitched to the back of a truck so that as the two move forwardly together a continuous filling of the hopper may take place. More usually however the hopper will be refilled intermittently as the need arises. A towing attachment is provided at **61a**.

For regulating the output of the material from the hopper, the bottom of the hopper is provided with two sliding doors **64** each of which, on its under side carries a nut (not shown) mounted on a threaded part of a rod **65** extending rearwardly to the rear end of the machine where the rod is provided with a hand wheel **66**. By rotation of the hand wheels **66** the sliding doors may be opened and closed so as to adjust the rate of outflow of the material from the hopper, or to interrupt the flow of material altogether.

Below the doors **64** and the outlet which they control is a levelling plate or bar **67** carried by levers **68** one end of which bar is pivotally mounted around the axis of the wheels **8** and the other end of which bar is connected by link **69** to a radial arm **70** mounted on a fixed shaft **71**. This shaft also carries a lever **72** which can be bolted to the main girder **1** at selected points **73**. The bar **67** acts as a first leveller or distributor to prepare the material for a more positive spreading by the plow.

On the plate **19** is a long casing **74** in which are burners **75** adapted to be fed at connection **76a** with an inflammable gas from the conduit **76b** of a gas bottle **77** carried on the super-structure **54**, on which also the tank **32** is mounted.

In the rear ends of the beams **13** of the subframe are screws **78** fitted at the top with wheels **79** and held at the bottom in shackles **80** on the reinforcing channels **20**. These screws **78** serve to determine the final thickness of the coating being spread.

In use, the operator stands on the top of plate **19** and, having first adjusted the height and camber of the screed **18a–18b** by means of the wheels **16** and **23**, and having adjusted the rear part of the spreader plate **19** by means of the wheels **78** to what he thinks is adequate, the vehicle is set in motion with the sliding doors **64** open to the desired extent and the material begins to fall through the bottom of the hopper to the road. Here it is spread in a primary way by the plate **67**, then further spread by the plow and finally spread by rotating the screws **44** when necessary or desirable. Next the material is met by the screed **18a**, **18b** which directs it under the plate **19** and this limits the thickness of the carpet put onto the road and any material which may become piled up against the screed, at any location therealong, may be distributed laterally by operating the distributing screws **44**.

The operator has the controls **16**, **23** and **79** within his reach for constant adjustment when necessary and he is able to steer the machine by means of wheel **9**. Also, on a control panel **81** (FIG. 2) there are other controls, including those **82**, **83**, **84** for the three hydraulic motors **32**, **33** and **34**. With these the operator controls

the progress of the machine, the rotation of the screws 44 and the transverse vibration of the plow.

What I claim is:

1. A machine for laying flowable, hardenable material on a road or like surface, the machine comprising:
(a) a wheel chassis,
(b) a hopper carried on the front end of the chassis,
(c) a sub-frame pivotally mounted on the front end of said chassis,
(d) a transverse screed mounted on the rear end of the sub-frame and extending transversely of the machine and including three aligned but spaced and separate screed parts,
(e) a common spreader plate attached to and projecting rearwardly from the said screed parts and extending transversely of the rear end of the frame,
(f) rigid bridging means connecting the outer two screed parts,
(g) moving means extending between said bridging means and the inner screed part and being operable to move the said inner screed part relative to the outer screed parts, thereby deforming the spreader plate,
(h) adjustable means interconnecting the sub-frame and said chassis for moving the sub-frame about its pivot to raise and lower the rear end of the sub-frame so as to regulate the height of the screed above the ground, and
(i) adjustable means for increasing and decreasing the angle of attack of the spreader plate.

2. A machine as claimed in claim 1, wherein the rigid and moving means comprise a rigid bridge piece and a screw and nut assembly respectively, the nut being secured to the inner screed part at one end of the screw and the other end of the screw being rotatably connected to the bridge piece.

3. A machine for laying flowable, hardenable material on a road or like surface, the machine comprising:
(a) a chassis,
(b) front and rear pairs of wheels carrying the chassis,
(c) a hopper mounted on the front end of the chassis,
(d) a sub-frame extending rearwardly from the front of the chassis, the said sub-frame being pivoted to the front end of the chassis,
(e) a transverse screed carried by said sub-frame at the rear end thereof, the said screed including outer and inner separate parts, rigid means connecting said outer parts,
(f) a common spreader plate attached to and projecting rearwardly from the said screed parts and extending transversely of the sub-frame,
(g) moving means extending between said rigid means and the inner screed part and being operable to move the inner screed part relative to the outer screed parts, thereby deforming the spreader plate,
(h) adjustable means interconnecting the sub-frame and said chassis for moving the sub-frame about its pivot to raise and lower the rear end of the sub-frame so as to regulate the height of the screed above the ground, and
(i) adjustable means for increasing or decreasing the angle of attack of the spreader plate.

4. A machine for laying flowable, hardenable material on a road or like surface, the machine comprising:
(a) a chassis,
(b) front and rear pairs of wheels carrying the chassis,
(c) a hopper mounted on the front end of the chassis and having an outlet,
(d) a sub-frame extending from the front of the chassis to the rear, the said sub-frame being pivoted to the front end of the chassis,

(e) a transverse screed carried by said sub-frame at the rear end thereof, the said screed including outer and inner separate parts, rigid bridging means connecting said outer parts, adjustable means connecting said bridging member to said inner member,
(f) a common transverse spreader plate attached to the lower surface of said screed parts and extending rearwardly thereof,
(g) adjustable means interconnecting the sub-frame and said chassis for moving the sub-frame about its pivot to raise and lower the rear end of the sub-frame so as to regulate the height of the screed above the ground,
(h) adjustable means for increasing or decreasing the angle of attack of the spreader plate,
(i) means for steering the chassis, and
(j) a plurality of separate manually operable means for operating the aforesaid moving means, adjusting means and steering means, all said manually operable means being located as to be operable by a single operative.

5. A machine according to claim 4, with a pair of rotatable spreading screws, each screw arranged on a transverse axis at one side of the machine immediately in front of the screed and means for effecting rotation of said screws.

6. A machine according to claim 5, which further comprises a power unit driving hydraulic pumps for operating a hydraulic motor to propel the machine through a differential gear drive unit, and for operating a hydraulic motor for rotating said screws, with means whereby said motors are controllable independently of each other.

7. A machine according to claim 4, which further comprises a heating means overlying and adjacent to the top surface of the spreader plate composed of a series of gas chambers fed with combustible gas from a pressurized container carried on the machine.

8. A machine according to claim 4, wherein the front end of said sub-frame is pivoted on the chassis adjacent the axis of the front wheels, and the rear end of said sub-frame is suspended from the chassis by screw-and-nut mechanism by which the sub-frame may be wound up to a position closely adjacent to the main chassis when not in use and wherein there is also another screw-and-nut mechanism which is operatively connected between the said sub-frame and the rear part of the spreader plate, for altering the angle of attack of the spreader plate relative to the longitudinal axis of the machine.

9. A machine according to claim 4, having sliding door means controlling the hopper outlet, with control means situated for regulating the degree of opening of said door means.

10. A machine according to claim 4, which further includes hydraulic lifting means to lift the sub-frame rapidly independently of its manual adjustment.

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