Jan. 28, 1964 E. K. DAVIS 3,119,138

SPREADER FOR VISCOUS MATERIALS

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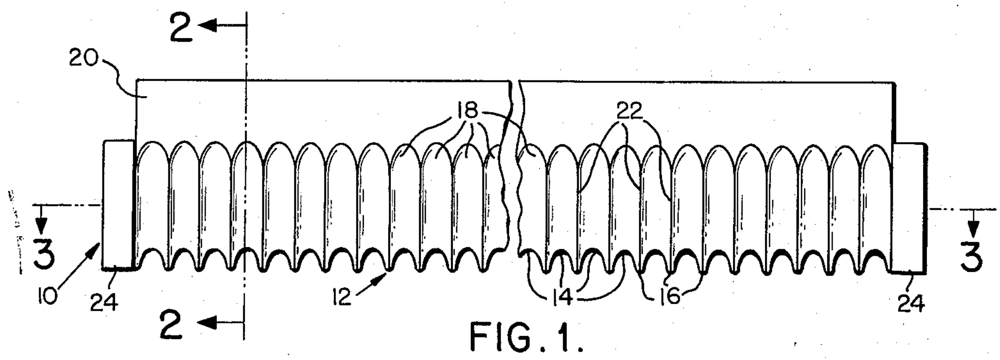

FIG. 1.

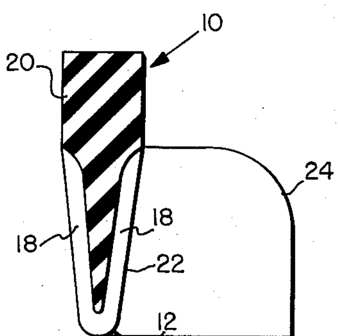

FIG. 2.

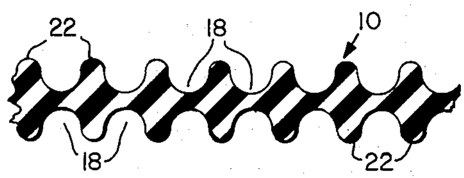

FIG. 3.

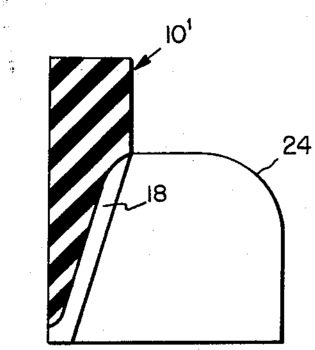

FIG. 4.

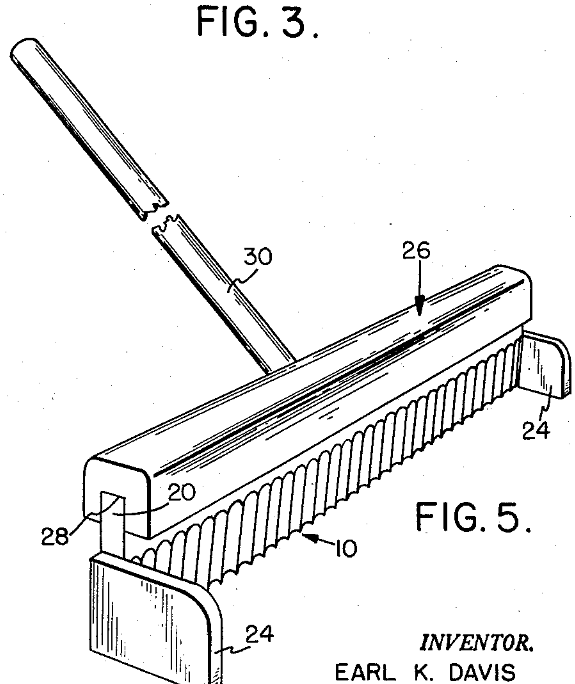

FIG. 5.

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SPREADER FOR VISCOUS MATERIALS

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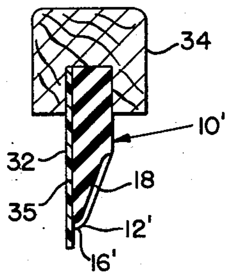

FIG. 6.

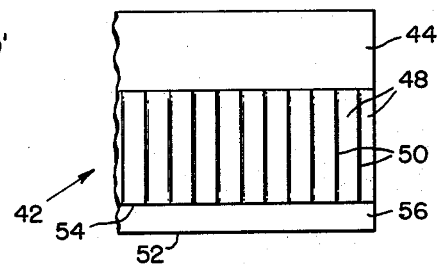

FIG. 7.

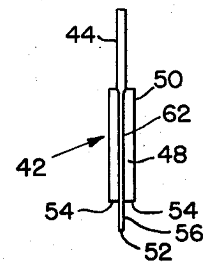

FIG. 8.

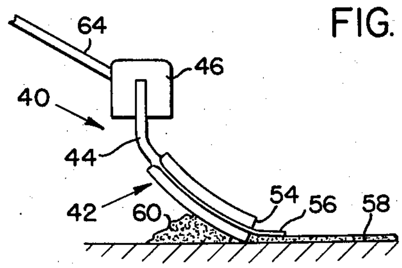

FIG. 10.

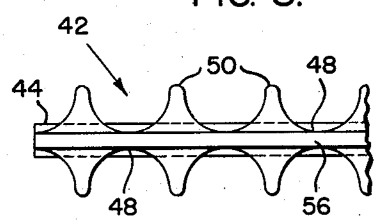

FIG. 9.

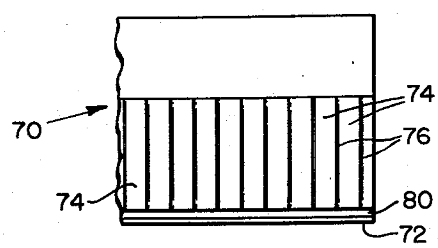

FIG. 11.

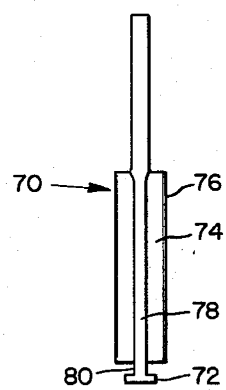

FIG. 12.

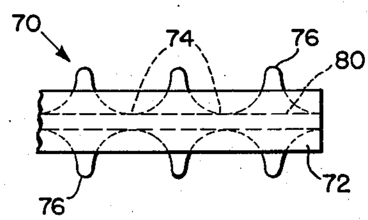

FIG. 13.

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3,119,138
SPREADER FOR VISCOUS MATERIALS

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Filed Jan. 11, 1962, Ser. No. 167,467
6 Claims. (Cl. 15—236)

This application is a continuation-in-part of my copending application, Serial Number 155,017, filed November 27, 1961, entitled Spreader for Viscous Materials, and now abandoned.

This invention relates to a novel spreader for viscous materials, and, more particularly, to a squeegee-like tool of novel configuration for applying a relatively viscous liquid to a surface at a relatively uniform rate.

The invention was developed in connection with the problem of applying relatively uniformly thick coatings of so-called cold-coat roofing material on flat roofs, and the embodiments described in this application have been especially designed for such use. The practice of the invention, however, is expected to be advantageous for applying many different viscous liquids to many different surfaces, and is not limited to the specific use described herein.

In the application of viscous materials to surfaces it is often desired to apply relatively thick coatings, yet for economy it is desired that the coatings be of relatively uniform thickness, close to the minimum thickness required. The application of such coatings is relatively difficult, particularly in cases where the coating is applied manually and where the base surface is not entirely smooth and regular. In applying so-called cold-coat roof coating materials, for example, previous practice has been to use a brush or an ordinary squeegee. Application of these materials by brushing is laborious and requires a certain degree of skill in order to achieve the desired degree of uniformity in the thickness of the coating. When the material is applied by a squeegee the work progresses more rapidly and with far greater ease, but it requires a relatively high degree of skill and difficult manipulation of the squeegee to obtain a coating of the desired thickness, because the squeegee tends to produce only a relatively thin coating and to wipe off all but a relatively thin layer of the liquid.

Accordingly, one important object of the present invention is to provide a novel spreader for spreading relatively viscous materials upon surfaces such as built-up roofs, the iregularities of which may be large relative to the desired thickness of the final coating.

Other objects are: to provide a novel spreader of this type which may be operated with the ease and speed of a squeegee, yet which is shaped to meter the viscous material at a predetermined rate to produce a coating of the desired thickness; to provide a novel spreader of this type which is sufficiently flexible to conform to irregularities in the surface, yet which is capable of producing a coating of uniform thickness on both irregular and regular portions of the surface; to provide a novel spreader of this type which includes means for metering the viscous material upon the surface in the form of adjacent, parallel ribbons, and means for pressing upon the ribbons to cause them to flow together to form a smooth, continuous coating despite the flow resistance of the viscous material; to provide a novel spreader of this type which may be operated with the ease and speed of a squeegee, yet which is shaped to meter the viscous material at a predetermined rate and to produce a smooth coating of the desired thickness; to provide a novel spreader of this type which is specially shaped to produce smooth coatings of relatively stubborn or highly flow resistant viscous materials; and in general, to provide a novel spreader for applying viscous materials, which is relatively inexpensive, yet easy to use and capable of producing highly reliable and uniform results.

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The foregoing and other objects and advantages of the invention will become apparent in the following detailed description of representative embodiments thereof, taken in conjunction with the drawings, wherein:

FIG. 1 is a front elevational view of a spreader blade according to a first embodiment of the present invention;

FIG. 2 is a cross-sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a fragmentary horizontal sectional view taken along the line 3—3 of FIG. 1;

FIG. 4 is a cross-sectional view of a spreader blade according to a second embodiment of the invention;

FIG. 5 is a perspective view of a complete spreader according to the first embodiment of the invention, showing the blade mounted in a mounting bar which is attached to a handle for convenience in working;

FIG. 6 is a cross-sectional view of a spreader according to a third embodiment of the invention, and intended especially for use with relatively stubborn, or flow resistant materials;

FIG. 7 is a front elevational view of a spreader blade according to a fourth embodiment of the present invention;

FIG. 8 is a side elevational view of the spreader blade shown in FIG. 7;

FIG. 9 is a fragmentary bottom view, on an enlarged scale of the spreader blade shown in FIGS. 7 and 8;

FIG. 10 is a side elevational view of the spreader shown in FIGS. 7, 8, and 9, as it appears in use;

FIG. 11 is a front elevational view of a spreader blade according to a fifth embodiment of the invention;

FIG. 12 is a side elevational view of the spreader blade shown in FIG. 11; and

FIG. 13 is a fragmentary bottom view of the spreader blade shown in FIGS. 11 and 12.

Briefly, the spreader of the present invention is somewhat similar to a squeegee in that it includes a flexible, resilient working blade. The working blade of the spreader of the present invention, however, has grooves of uniform depth extending along at least one of its side surfaces from its spine, or supporting portion towards its working edge. The grooves function to meter out the viscous material in narrow, adjacent, and parallel ribbons when the blade is flexed and drawn along the surface to be coated with the flutes, or ribs that separate the grooves in contact with the surface.

The blade according to the first embodiment of the invention is intended primarily for use with relatively less stubborn viscous materials, that is, those having natural flow characteristics such that the ribbons will flow together by themselves to form a smooth, even coating after they have been formed by the blade. The blade has a serrated working edge and grooves extending along at least one side surface away from the working edge and in alignment with the serrations. The grooves are of substantially uniform depth along their length and are shaped similarly to the serrations, so that whether the serrated working edge of the blade engages the surface to be coated, or the blade is flexed so that its side surface engages the surface, uniform quantities of the viscous material are metered out upon the surface as the blade is drawn along the surface. The blade thus acts to form the viscous liquid into adjacent, parallel ribbons upon the surface being coated, which thereafter flow together to form a coating of relatively uniform thickness.

Certain viscous materials, however, are relatively stubborn, being so highly flow resistant that the ribbons will not flow together in a reasonable time. This is especially so in the case of certain asbestos reinforced cold-coat roofing materials. The spreaders according to the third, fourth, and fifth embodiments of the invention are all intended primarily for use with such materials, although they are equally advantageous for use with the relatively less stubborn materials. These spreaders include means for pressing upon the ribbons after they have been formed by the grooves and flutes to force the ribbons to flow together and to form a smooth, continuous coating upon the surface.

Referring first to FIGS. 1 to 3, the spreader shown therein includes a blade **10** having a serrated working edge **12**, the serrations **14** being of any desired configuration, but preferably semi-circular in shape, and separated by convexly curved protuberances **16**, which are narrow relative to the serrations **14**. Grooves **18** extend rearwardly from the working edge **12** in alignment with the respective serrations **14**. The grooves **18** are preferably of the same cross-sectional configuration as the configuration of the serrations **14**, and are of uniform depth throughout substantially their entire length. The grooves extend along substantially the entire working width of the blade **10**, terminating adjacent to the relatively thick supporting portion, or spine **20** of the blade. The grooves **18** preferably extend along both sides of the blade **10** as shown in FIG. 2 so that the spreader may be worked with uniform results in both directions. Alternatively, however, the grooves **18** may extend along only one face of the blade as illustrated in FIG. 4, which type of construction may be desired for certain applications.

The grooves **18** are of uniform depth, and of the same depth and configuration as the serrations **14**, thereby insuring uniform spreading of the viscous material on the working surface regardless of the angle of attack of the spreader. In use, for example, certain portions of the spreader blade **10** will often be flexed due to irregularities in the surface being coated, while other portions are not, so that one portion of the surface being worked is contacted by the edge **12** of the blade, while another portion is contacted by the grooved side of the blade. In such a situation, the serrations **14** serve to meter out substantially the same quantities of viscous material upon the surface being worked as the grooves **18** so that a uniform coating thickness is produced over the entire length of the blade **10**.

The blade **10** is made of an elastomeric material such as rubber, or a resin, having a durometer rating approximately in the range of about Shore A–50 to A–90, the exact rating being selected in view of the dimensions of the blade and the viscosity of the material to be spread. For cold-coat roofing materials for example, a relatively stiff blade having a durometer rating of approximately Shore A–85 to A–90 has been found to provide excellent results. Preferably, the blade **10** is made of a thermoplastic polyurethane, because of the relatively high degree of abrasion resistance of this material coupled with its ease of manufacture by molding.

In one embodiment of the invention in which the blade **10** was designed for applying cold-coat roofing materials, the grooves **18** and the serrations **14** were of semi-circular shape and curved on a radius of about 1.5 mm. The protuberances **16** between the serrations **14**, and the ribs **22** between the grooves **18** were also semi-circularly shaped but convex and curved on about a 0.5 mm. radius. The over-all length of the grooves was about one inch, and the width of the supporting portion **20** of the blade about one-half inch. The supporting portion **20** of the blade was about one-half inch thick.

As shown in FIG. 2, the blade **10** is preferably tapered from its supporting portion **20** down toward its working edge **12** to insure proper flexing and to avoid concentration of bending stresses at the root where the working portion of the blade joins the supporting portion **20**.

When preparing a built up roof, it is often desired to spread individual, relatively narrow strips of viscous material, which are successively covered by strips of impregnated paper. For such work, guard pads **24** are mounted at the opposite ends of the blade **10**, being either integrally molded with or otherwise fixed to the blade for retaining excess material in front of the blade and preventing it from spilling around the ends of the blade. The guard pads **24** are preferably relatively soft and lightly resilient so as to yield readily in response to flexing of the blade **10** and to allow the blade **10** to maintain full contact with the working surface. The bottom surfaces (not separately designated) of the guard pads are in the plane of the protuberances **16** of the serrated working edge of the blade when the blade **10** is in its relaxed position, as shown.

When the spreader is to be used for producing a continuous coating over a relatively large area, it is preferably used without the guard pads **24**, especially if the material being spread is tacky.

The blade **10** may be mounted in any convenient holder such as the holder **26** illustrated in FIG. 5, which consists of an elongated block of wood such as oak or maple having a longitudinal slot **28** in one surface for receiving the supporting portion **20** of the blade **10**. A handle **30** is secured by any desired means to the holder **26** for manipulating the spreader.

Spreaders that include only a blade **10** or **10′** of the kind shown in FIGS. 1 to 5 provide optimum results only when they are used for spreading materials having reasonably easy flow characteristics such that the ribbons left by the blade **10** or **10′** will flow together by themselves and reduce under the action of gravity and surface tension to a smooth, non-striated coating. The embodiments of the invention illustrated in FIGS. 6 to 13 effectively overcome this limitation, and include means for mechanically pressing upon the ribbons, and thereby reducing them even though the material being spread is relatively highly stubborn, or flow resistant.

The embodiment shown in FIG. 6 includes a spreader blade **10′** similar to the one shown in FIG. 4, and having grooves **18** along one face, and an auxiliary presser blade **32** mounted in the same holder **34** with the spreader blade **10′** adjacent to the smooth face **35** thereof. The presser blade **32** is mounted parallel to the spreader, or metering blade **10′**, and projects beyond the serrated working edge **12′** of the blade. The presser blade **32** may be mounted immediately adjacent to and in contact with the spreader blade **10′** as shown, or, if desired, it may be spaced from the spreader blade **10′**.

The presser blade **32** is sufficiently flexible so that it does not have a scraping, or metering effect on the viscous material being spread. It is sufficiently resilient, however, to press upon the ribbons of viscous material formed by the spreader blade **10′** with enough force to cause the ribbons to flow laterally, and to merge into a smooth, continuous coating of uniform thickness. The exact degree of resilience should be selected in view of the stubbornness of the material to be spread.

The presser blade **32** may, for example, consist of a strip of cellulose acetate about twenty-five thousandths of an inch thick, and sufficiently wide to extend about an eighth to a quarter inch beyond the protuberances **16′** of the working edge of the metering blade.

The spreader illustrated in FIG. 6 is limited to working in only one direction. The presser blade **32** must always trail the metering blade **10′**. It is for this reason that it is shown with the single-sided metering blade **10′**. The double-sided metering blade **10** shown in FIGS. 2 and 3 may also be used as an alternative in the spreader shown in FIG. 6 in place of the single-sided blade **10′**, but the grooves **20** facing the pressure blade **32** cannot then be used.

The embodiments of the invention illustrated in FIGS. 7 to 13 overcome this limitation, and are bi-directional. Both their metering means and their smoothing means are fully operative in both directions of working without mutual interference between them.

The spreader 40 illustrated in FIGS. 7 to 10 is intended primarily for spreading viscous materials of easy and medium flow resistance, that is, for all but the most stubborn materials. The spreader 40 includes a working blade 42 of a flexible, resilient, and abrasion-resistant material such as thermoplastic polyurethane, which is believed to be among the best presently available materials for the purpose. The blade 42 includes a spine, or supporting portion 44 by which it may be mounted in a holder 46 for easy manipulation. Grooves 48 separated by flutes 50 extend along the sides of the blade 42 from the spine 44 toward the outer edge 52 of the blade. The grooves 48 are of uniform depth along substantially their entire lengths. The flutes 50 and the grooves 48 terminate at their outer ends along a line 54 spaced inwardly from the outer edge 52 of the blade. The ends of the grooves 48 and flutes 50 constitute the metering edge of the blade 42.

A smoothing fin 56 molded integrally with the rest of the blade 42 extends outwardly from the metering edge 54 for a distance of about one-quarter inch, more or less, depending upon the resilience of the fin 56 and the viscosity and flow resistance, or stubbornness of the material to be spread.

As best shown in FIG. 10, sufficient pressure is applied to the blade 42 during use so that the flutes 50 contact the surface 58 being worked, different portions of the blade bending to different degrees to accommodate irregularities in the surface 58 along the length of the blade, but all portions of the blade 42 being flexed sufficiently to cause at least a relatively small terminal portion of the flutes 50 to lie within about 45° of the surface 58, or flatter. Thus, the grooves 48 will serve to meter out substantially uniform quantities of the viscous material 60 upon the surface 58 in the form of relatively narrow, adjacent, parallel ribbons.

The smoothing fin 56 constitutes the trailing portion of the blade 42 regardless of the direction in which the blade is worked, and presses upon the parallel ribbons of the viscous material causing them to flatten out and to merge with one another, thereby forming a continuous coating of uniform thickness across the entire length of the blade.

The material of the blade 42 and the dimensions of the various portions thereof are selected, in view of the viscosity of the material to be spread, to provide for proper flexing action of the blade 42 in use. The core portion 62 (FIG. 8) between the grooves 48 on the opposite sides of the blade is preferably made relatively thin to compensate for the stiffening effect of the flutes 50. The spine 44 is preferably of an intermediate thickness, that is, intermediate in thickness between the thickness of the core 62 and the over-all thickness of the grooved portion of the blade. It is desirable that the spine 44 be relatively more flexible than the grooved portion of the blade 42 so that, in use, the flutes 50 can be brought into contact with the surface being coated by the application of a reasonable pressure upon the spreader handle 64. The blade 42 is sufficiently flexible in its lengthwise direction so that it can flex differently at different portions along its length to conform to irregularities in the surface being coated.

The smoothing fin 56 may be of approximately the same thickness as the core 62 of the blade so that it yields relatively readily and does not exert sufficient pressure on the material being spread to effect a metering action supplemental to the metering action of the grooves 48 and the flutes 50.

The material of the blade 42 may have, for example, a durometer hardness rating in the range of about Shore 40 to about Shore 90, and is preferably softer than the blades 10 and 10′ described hereinabove in connection with FIGS. 1 to 5. The blade 42 should flex more readily, and not require undue effort to keep the flutes 50 in contact with the surface 58 being coated.

When the blade 42 is intended for use in spreading cold-coat roofing materials, for example, it may be integrally molded of a thermoplastic polyurethane having a durometer rating of about Shore 50. In this case, the grooves 48 may be of semi-circular cross section, curved on a radius of about $\frac{5}{64}$ inch; the flutes 50 may also be curved, but convex, and on about a $\frac{1}{64}$ inch radius; the over-all length of the grooves 48 and flutes 50 may be about $\frac{3}{4}$ inch; the minimum core thickness, about $\frac{1}{32}$ inch; the overall thickness of the grooved portion, about $\frac{3}{16}$ inch; the thickness of the spin 44, about $\frac{3}{32}$ inch; and the thickness of the fin 56, about $\frac{1}{32}$ inch. The spine 44 may be mounted to support the grooved portion about $\frac{1}{4}$ inch from the support 46, and the fin 56 may extend about $\frac{1}{4}$ inch from the metering edge 54.

The blade 70 shown in FIGS. 11 to 13 is generally similar to the blade 42 shown in FIGS. 7 to 10, except that, in place of the fin 56, it carries a smoothing bar 72 spaced slightly outwardly from the ends of the grooves 74 and the flutes 76. The blade 70 is intended primarily for spreading the most stubborn, or flow resistant materials, but may also be used for applying relatively less stubborn materials.

The bar 72 is preferably molded integrally with the rest of the blade 70, and, as shown, is in the form of an extension of T-shaped cross section to the core 78. The bar 72 constitutes the cross of the T, and the supporting portion 80 constitutes the stem.

In use, the bar 72 serves not only to smooth the ribbons of viscous material as they emerge from the grooves 74, but also to meter the material and to control the final thickness of the coating. The grooves 74 and the flutes 76 feed the viscous material to the bar 72, and keep the bar properly spaced from the surface being coated. In the ideal case, the grooves 74 would meter the viscous material at exactly the rate called for by the bar 72, but because of differences in the angle at which the bar 72 is supported as caused by variations in flexing of the blade along its length, this is relatively difficult to achieve. It is preferred, therefore, to make the grooves 74 slightly larger than required to match the metering action of the bar 72, and to rely upon the bar for the final determination of the coating thickness.

The bar 72 should be spaced sufficiently far from the open ends of the grooves 74 to permit the viscous material being spread to flow together after it emerges from the grooves 74. In practice, this may require a spacing of about a sixteenth of an inch, more or less, depending on the flow resistance of the material to be spread.

The bar 72 should be positioned as close to the ends of the grooves and flutes as possible in view of the flow requirement in order that it be supported as rigidly as possible with respect to its spacing from the surface being coated. The supporting portion 80 should be fully as thick as the core 78 of the blade, and may, if desired, be flared outwardly from the core 78 toward the bar 72 for increased rigidity.

In use, the blade 70 is flexed similarly to the blade 42 shown in FIGS. 7 to 10, and may be worked in either direction. The flexibility of the blade 70 allows it to conform to irregularities in the surface being coated similarly to the other blades described hereinabove.

I claim:

1. A spreading device for spreading a coating of relatively uniform thickness of a relatively vicous liquid upon a surface comprising a flexible, resilient blade having a working edge, said blade having grooves along at least one face thereof extending away from said working edge, said grooves being separated by flutes that are narrower than said grooves, said grooves being of uniform depth along substantially their entire length, whereby when said blade is drawn over a surface upon which the viscous liquid has been placed with the grooved face of said blade in engagement with the surface, the viscous liquid escapes from the blade in the form of relatively uniformly thick

parallel adjacent ribbons despite variations in the degree of flexure of said blade, said device also including means for pressing upon the ribbons so formed as said device is drawn along the surface thereby to cause the ribbons to flow laterally and to merge together into a smooth coating.

2. A spreading device for spreading a coating of relatively uniform thickness of a relatively viscous liquid upon a surface comprising a flexible, resilient blade having a working edge, said blade having grooves along at least one face thereof extending away from said working edge, said grooves being separated by flutes that are narrower than said grooves, said grooves being of uniform depth along substantially their entire length, whereby when said blade is drawn over a surface upon which the viscous liquid has been placed with the grooved face of said blade in engagement with the surface, the viscous liquid escapes from the blade in the form of relatively uniformly thick parallel adjacent ribbons despite variations in the degree of flexure of said blade, said device also including means for pressing upon the ribbons so formed as said device is drawn along the surface thereby to cause the ribbons to flow laterally and to merge together into a smooth coating, said means including a relatively lightly resilient blade having a smooth working edge, and means mounting said lightly resilient blade adjacent and parallel to said grooved blade with said smooth working edge projecting beyond said working edge of said grooved blade.

3. A spreading device for spreading a coating of relatively uniform thickness of a relatively viscous liquid upon a surface comprising a flexible, resilient blade having a working edge, said blade having grooves along at least one face thereof extending away from said working edge, said grooves being separated by flutes that are narrower than said grooves, said grooves being of uniform depth along substantially their entire length, whereby when said blade is drawn over a surface upon which the viscous liquid has been placed with the grooved face of said blade in engagement with the surface, the viscous liquid escapes from the blade in the form of relatively uniformly thick parallel adjacent ribbons despite variations in the degree of flexure of said blade, said device also including means for pressing upon the ribbons so formed as said device is drawn along the surface thereby to cause the ribbons to flow laterally and to merge together into a smooth coating, said means including a relatively lightly resilient blade having a smooth working edge, and means mounting said lightly resilient blade adjacent and parallel to said grooved blade on the side thereof opposite from a grooved face thereof with said smooth working edge projecting beyond said working edge of said grooved blade.

4. A spreading device for spreading a coating of relatively uniform thickness of a relatively viscous liquid upon a surface comprising a flexible, resilient blade having a working edge, said blade having grooves along at least one face thereof extending away from said working edge, said grooves being separated by flutes that are narrower than said grooves, said grooves being of uniform depth along substantially their entire length, whereby when said blade is drawn over a surface upon which the viscous liquid has been placed with the grooved face of said blade in engagement with the surface, the viscous liquid escapes from the blade in the form of relatively uniformly thick parallel adjacent ribbons despite variations in the degree of flexure of said blade, said device also including means for pressing upon the ribbons so formed as said device is drawn along the surface thereby to cause the ribbons to flow laterally and to merge together into a smooth coating, the ends of said grooves adjacent to said working edge being open, said means including a fin-like projection extending beyond the open ends of said grooves.

5. A spreading device for spreading a coating of relatively uniform thickness of a relatively viscous liquid upon a surface comprising a flexible, resilient blade having a working edge, said blade having grooves along at least one face thereof extending away from said working edge, said grooves being separated by flutes that are narrower than said grooves, said grooves being of uniform depth along substantially their entire length, whereby when said blade is drawn over a surface upon which the viscous liquid has been placed with the grooved face of said blade in engagement with the surface, the viscous liquid escapes from the blade in the form of relatively uniformly thick parallel adjacent ribbons despite variations in the degree of flexure of said blade, said device also including means for pressing upon the ribbons so formed as said device is drawn along the surface thereby to cause the ribbons to flow laterally and to merge together into a smooth coating, the ends of said grooves adjacent to said working edge being open, said means including a fin-like portion projecting beyond the open ends of said grooves and having a surface joined flush with the bottoms of said grooves.

6. A spreading device for spreading a coating of relatively uniform thickness of a relatively viscous liquid upon a surface comprising a flexible, resilient blade having a working edge, said blade having grooves along at least one face thereof extending away from said working edge, said grooves being separated by flutes that are narrower than said grooves, said grooves being of uniform depth along substantially their entire length, whereby when said blade is drawn over a surface upon which the viscous liquid has been placed with the grooved face of said blade in engagement with the surface, the viscous liquid escapes from the blade in the form of relatively uniformly thick parallel adjacent ribbons despite variations in the degree of flexure of said blade, said device also including means for pressing upon the ribbons so formed as said device is drawn along the surface thereby to cause the ribbons to flow laterally and to merge together into a smooth coating, the ends of said grooves adjacent to said working edge being open, said means including a bar having a smooth edge, and means for supporting said bar in a position spaced outwardly from the open ends of said grooves with said smooth edge aligned intermediately between the bottoms of said grooves and the tops of said flutes, said bar being spaced sufficiently far from the open ends of said grooves to permit the ribbons of the viscous liquid formed by said grooves to flow laterally together in the space between the ends of said grooves and said smooth edge as said device is drawn along the surface.

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