

July 16, 1963

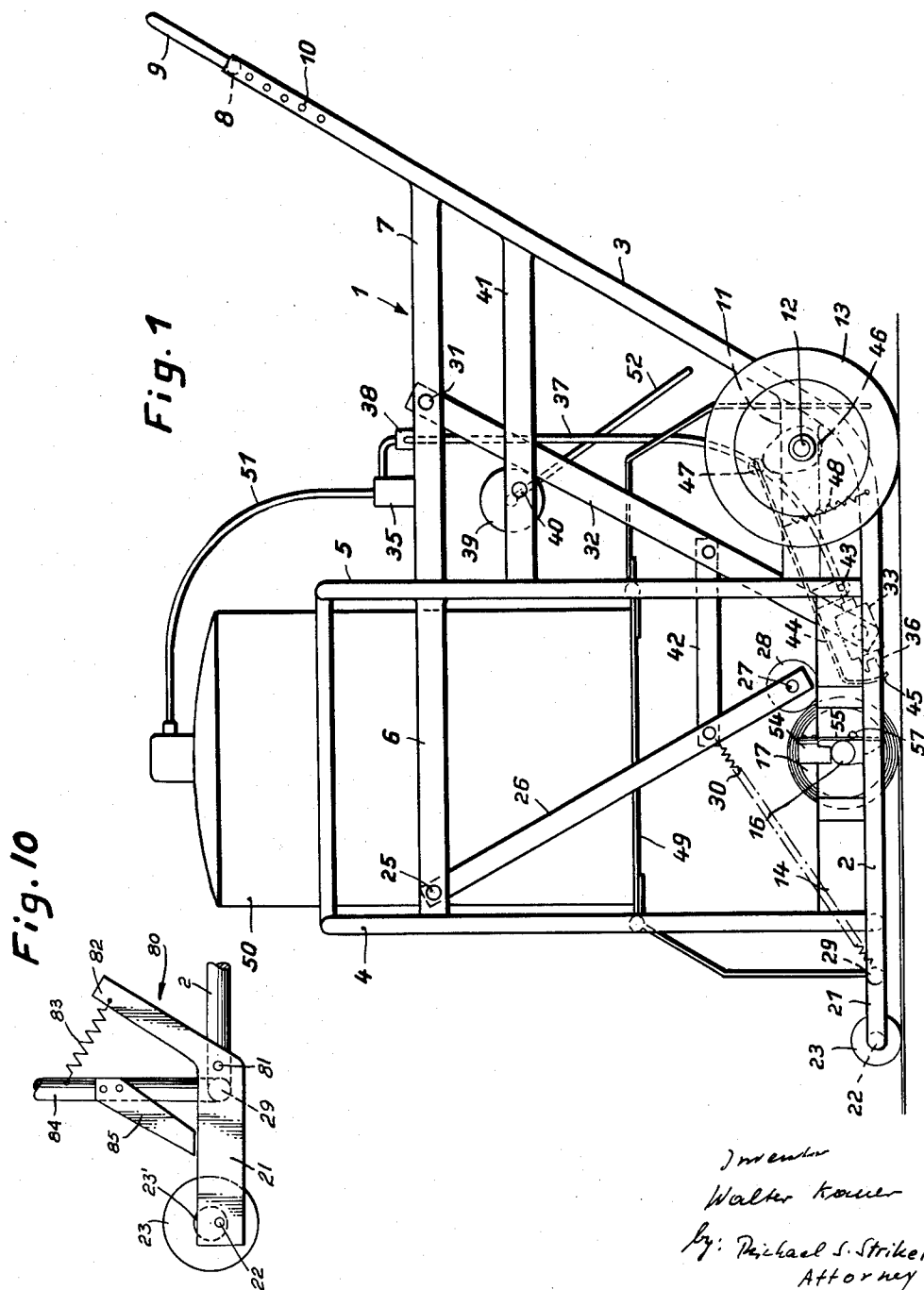
W. KAUER

3,097,986

SHEET APPLYING APPARATUS

Original Filed Aug. 29, 1958

4 Sheets-Sheet 1



July 16, 1963

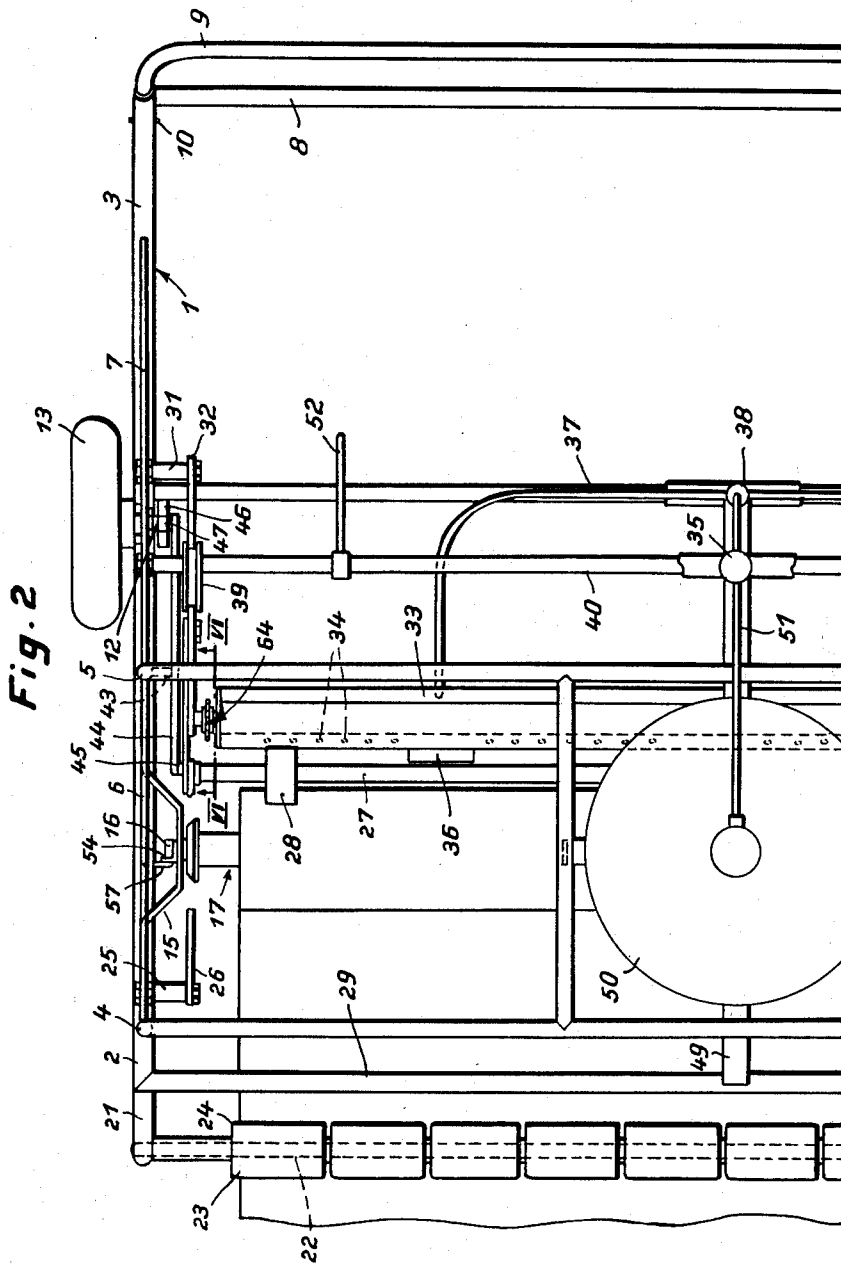
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SHEET APPLYING APPARATUS

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4 Sheets-Sheet 2



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SHEET APPLYING APPARATUS

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4 Sheets-Sheet 3

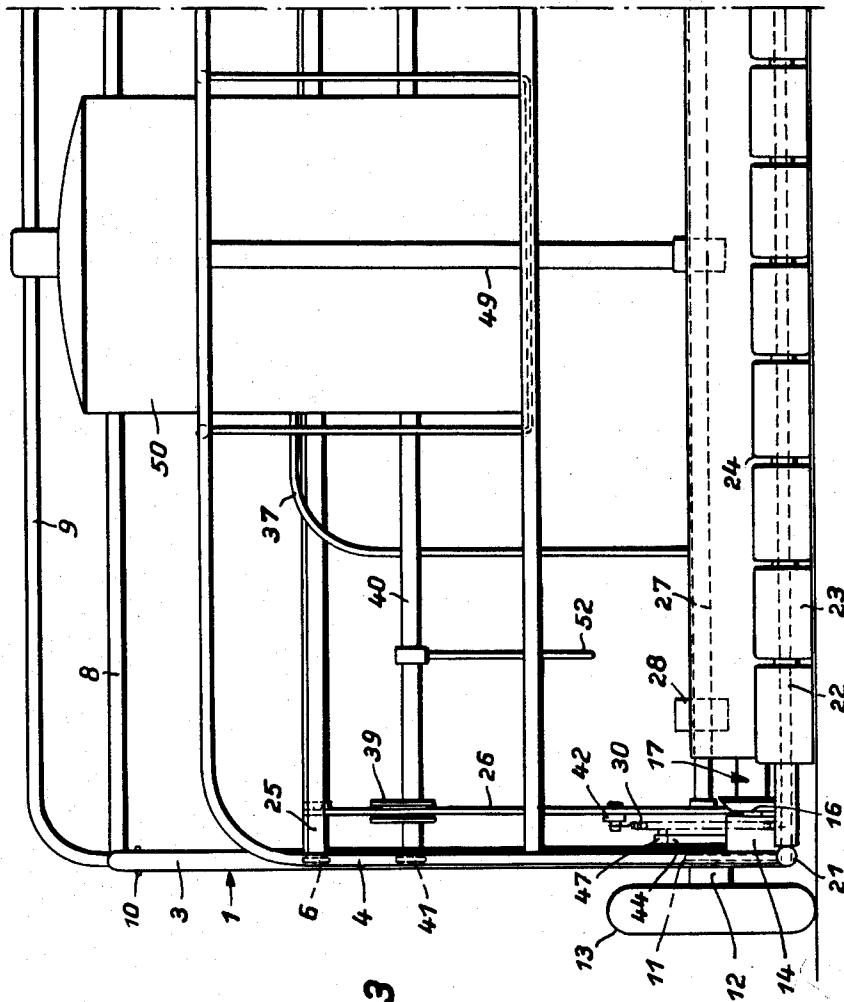


Fig. 3

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4 Sheets-Sheet 4

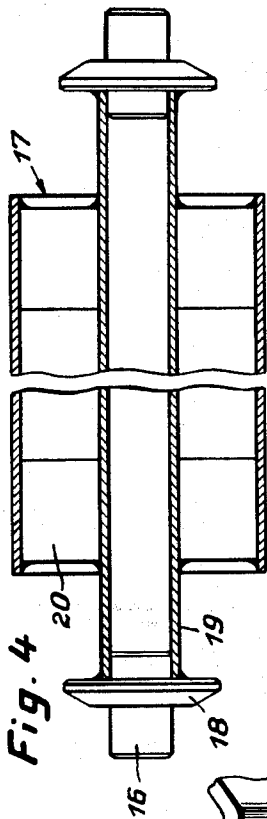


Fig. 5

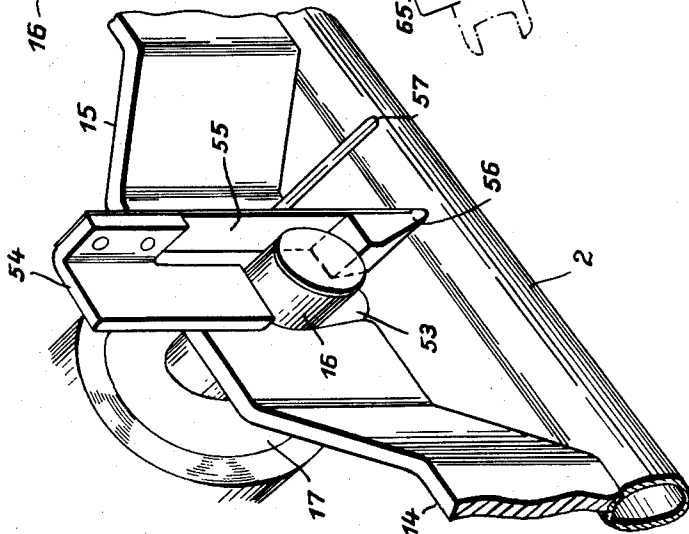


Fig. 7

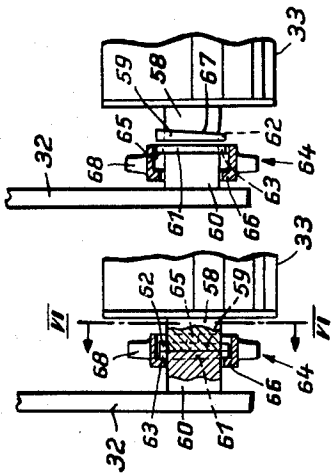


Fig. 6

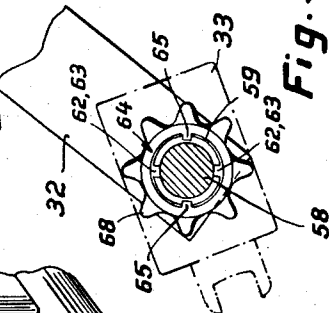


Fig. 8

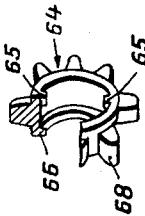
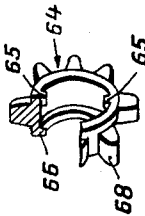


Fig. 9



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3,097,986

SHEET APPLYING APPARATUS

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Original application Aug. 29, 1958, Ser. No. 758,012. Di-
vided and this application Aug. 10, 1961, Ser. No.
130,684

9 Claims. (Cl. 156—497)

The present invention relates to an apparatus for applying a sheet to a surface to be covered thereby.

The present application is a division of my copending application Serial No. 758,012, filed August 29, 1958, now Patent No. 3,060,077, entitled "Sheet Applying Process and Apparatus."

The apparatus of the present invention is used, for example, in the roofing industry for applying a sheet of roofing paper to a surface to be covered by such sheet. Such a surface may be the upper surface of a sheet of paper or the like already applied to a roof, for example, and a suitable adhesive joins the sheets together. At the present time, however, it is difficult to apply a sheet of this type in such a manner that it will reliably adhere to the desired extent and at the desired locations to the surface which it covers. Because of non-uniform cooling of the adhesive there are invariably places where the sheet should but does not adhere to the surface which it covers.

One of the objects of the present invention is to provide an apparatus which will apply a sheet to a surface in such a way that the sheet will reliably adhere to the surface at least at predetermined portions of the sheet and surface.

Another object of the present invention is to provide a device which will reliably press a roll of the sheet to be applied to a given surface against the surface while the sheet is being unrolled onto the same.

A further object of the present invention is to provide an apparatus which will reliably heat a surface portion of a sheet and a portion of the surface to be contacted by the surface portion of the sheet immediately prior to the joining of these surface portions to each other.

An additional object of the present invention is to provide a device which automatically maintains a heating means at a predetermined position with respect to a roll of a sheet during the time that the sheet is being unrolled and the roll thickness is decreasing in such a way that the distance between the heating means and the exterior surface of the roll remains substantially unchanged during unrolling of the sheet.

Still another object of the present invention is to provide a device which will automatically limit the heating of the sheet to predetermined areas thereof which are spaced from each other both longitudinally and transversely of the sheet.

A still further object of the present invention is to provide a device of the above type with a means which will press the sheet against the surface to be covered thereby immediately after the sheet has been applied to the surface.

It is also an object of the present invention to provide a device of the above type which can easily be adjusted so as to be capable of being operated comfortably by any operator.

Yet another object of the present invention is to provide a device of the above type which is self-contained in the sense that it includes within itself all of the re-

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quired components such as the sheet to be applied to the surface to be covered as well as a source of heat which supplies a heating medium to a heating means which heats the sheet.

It is also an object of the present invention to provide a structure capable of accomplishing all of the above objects and at the same time composed of simple ruggedly constructed elements which are very reliable in operation.

With the above objects in view the present invention includes, in a device for applying to a surface to be covered a sheet which adheres thereto, a carriage means which is movable along the surface to be covered and a roll carrying means turnably carried by the carriage means for supporting a roll of the sheet which is to cover the above surface in a position where the roll directly engages the surface to be covered to be unrolled onto the same during movement of the carriage means on this surface. A heating means is carried by the carriage means for heating the sheet which is unrolled onto the surface to be covered.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a side elevational view of a device according to the present invention;

FIG. 2 is a fragmentary top plan view of the structure of FIG. 1;

FIG. 3 is an elevational end view of the structure of FIGS. 1 and 2 as seen from the left of FIGS. 1 and 2;

FIG. 4 is a fragmentary longitudinal sectional illustration of a roll carrying means according to the present invention;

FIG. 5 is a fragmentary perspective view of the manner in which the roll carrying means is connected with the carriage means;

FIG. 6 is a sectional view on an enlarged scale taken along the line VI—VI of FIGS. 2 and 7 in the direction of the arrows showing how a heating means is removably connected with the device;

FIG. 7 is a fragmentary axial partly sectional view of one end of a heating means shown connected with the carriage means;

FIG. 8 shows the structure of FIG. 7 with the end of the heating means disconnected;

FIG. 9 is a fragmentary partly sectional view of the releasable lock means used in the part of the device illustrated in FIGS. 6-8; and

FIG. 10 is a fragmentary elevational view on an enlarged scale of the structure shown at the lower left of FIG. 1, FIG. 10 illustrating the details of a pressing means which presses a sheet against the surface covered thereby.

Referring now to FIGS. 1-3, the carriage means of the present invention is generally designated with the reference character 1 and includes a framework of metal tubes and bars which are welded together, for example. This framework includes an outer frame made up of a horizontal lower frame portion 2 and a pair of hollow rigid tubes 3 located at opposite sides of the carriage means 1 and extending upwardly and forwardly from the front end of the lower frame portion 2. This lower frame por-

tion 2 carries a rear vertical frame member 4 of substantially U-shaped configuration having a top cross bar and a pair of downwardly directed legs fixed at their bottom end respectively to the lower frame portion 2. Also, the lower frame portion 2 fixedly carries a front vertical frame member 5 substantially cylindrical with the frame member 4 and also fixed at its bottom ends to the frame member 2. A pair of side bars 6 are respectively located at opposite sides of the carriage means 1, and each side bar is welded at one end to a leg of member 4 and at its opposite end to a leg of member 5. A pair of side bars 7 are also respectively located at opposite sides of the carriage means, and each of these side bars is welded at one end to a leg of frame member 5 and at an opposite end to the upwardly directed member 3. These members 3 are interconnected at their top ends by a horizontal rod 8 which is fixed at its opposite ends to the tubular members 3 without extending into the same. A substantially U-shaped handle member 9 has a top cross bar located at a higher elevation than the rod 8 and extending across the entire carriage means as well as a pair of legs extending slidably into the tubes 3, respectively. This interconnection of the downwardly directed legs of handle 9 with the tubes 3 forms an adjusting means for adjusting the elevation of the handle 9 so that the device can be comfortably operated by operators of different heights, and this adjusting means further includes pairs of aligned openings at the top end portion of each member 3 adapted to be selectively aligned with a transverse bore in each leg of the member 9 with pins 10 respectively passing through these bores and the pairs of aligned openings of the tubes 3 for releasably holding the handle 9 at a selected elevation.

A pair of bars 11 are located between frame member 5 and the upwardly directed tubes 3 with each bar 11 fixed as by welding at one end to a leg of member 5 and at an opposite end to a member 3, these bars 11 being located at the same elevation and respectively carrying coaxial bearings for a pair of coaxial axle portions 12 rotatably supported in this way by the pair of bars 11 and cooperating to form the only axle means of the carriage means 1. These axle portions 12, which are restrained by any suitable collars or the like against axial movement, fixedly carry wheels 13, respectively, which are preferably provided with air tires. Thus, the wheels 13 and axle portions 12 rotate together during movement of the carriage means and form the single wheel-carrying axle means of the device. These wheels are adapted to ride on the surface to be covered.

A pair of elongated bars 14 are respectively located at the opposite sides of the carriage means 1 and extend along the top surface of the lower frame portion 2, each bar 14 being fixed as by welding at one end to a leg of frame member 4 and at an opposite end to a leg of frame member 5. Each bar 14 is provided with an inwardly bent central portion 15, as shown most clearly in FIG. 5, and these central portions 15 serve as bearings for the roll-carrying means 16, 17. This latter roll carrying means 16, 17 serves to carry a roll of a sheet to be applied to the surface to be covered, and part of such a roll is indicated in FIG. 1. The roll carrying means includes a pair of end journals 16 and an elongated cylinder 17, the latter directly carrying the roll of paper and being formed with an unillustrated axial slot which serves to connect the roll of paper to the cylinder 17.

As may be seen from FIG. 4, in addition to the end stub shafts 16, the roll carrying means includes an elongated tube 19 which receives the ends of the shafts 16 which are directed toward each other, and the ends of the tube 19 are respectively welded to a pair of annular dished members 18 which are respectively fixed to the shafts 16 around which the rings 18 respectively extend. The tube 19 extends coaxially through and beyond the cylinder 17 and fixedly carries at its outer surface a plurality of radially positioned rigid plates 20 distributed

circumferentially about and longitudinally along the tube 19. The outer ends of the plates 20 are fixed as by welding to the inner surface of the hollow cylinder 17, so that in this way a rigid roll carrying means is provided. The cylinder 17 has a length which is somewhat shorter than the width of the sheet rolled onto the cylinder 17 and the ends of this sheet extend beyond the ends of the cylinder 17 so that the latter cannot become soiled at its end edges with bitumen or the like.

As may be seen from FIG. 5, each central portion 15 of the bars 14 is formed with an upwardly directed notch 53 extending from the bottom edge of each bar 14 and receiving one of the shafts 16. Associated with each central portion 15 of each bar 14 is a means which permits the roll carrying means to be easily and quickly assembled with the bearing arms 14 which rotatably support the roll carrying means 16—20 but which prevents the roll carrying means from being disconnected from the bars 14 without certain manipulations by the operator. Thus, as may be seen from FIG. 5, each portion 15 fixedly carries a bracket 54 which in turn fixedly carries a relatively strong leaf spring 55 extending downwardly from the bracket and fixedly carrying at its bottom end a wedge-shaped catch member 56 which engages the underside of each stub shaft 16 to maintain the latter rotatably in the notch 53. It is apparent that when the roll carrying means with a roll of paper or the like thereon is to be connected to the carriage means 1, it is only necessary to move the end shafts 16 of the roll carrying means upwardly into the notches 53, respectively, and these shafts will displace the catch members 56 against the force of the leaf springs 55, these catch members automatically snapping back to their operating positions beneath the shafts 16 when the latter have been moved sufficiently into the notches 53, respectively. Then the roll carrying means is rotatably supported by the carriage means 1. Each leaf spring 55 has a rod 57 fixedly connected thereto so that whenever it is desired to remove the roll carrying means the operator can engage the rods 57 to turn the catch members 56 away from their positions beneath the shafts 16 so as to release the roll carrying means.

The bottom frame portion 2 of the carriage means 1 includes at the trailing end of the carriage means a cross bar 29. A pressing means is connected to the trailing end portion of the carriage means for pressing downwardly on a sheet immediately after it has been applied to a surface to be covered. This pressing means includes an elongated rod 22 extending transversely across the carriage means and being substantially parallel to the bar 29. This rod 22 is fixedly connected at its ends to a pair of arms 21, respectively, which form parts of a pair of bell cranks 80 pivotally connected by a pair of pivot pins 81, respectively, to the sides of frame portion 2 adjacent to the rear bar 29 thereof. These bell cranks respectively include upwardly directed arms 82 which are respectively connected with springs 83. These springs are also connected with a pair of upwardly directed rigid members 84 fixed as by welding to the top surface of cross bar 29 at the ends of the latter so that the springs 83 urge the bell cranks 80 in a counterclockwise direction, as viewed in FIG. 10, and in this way the rod 22 is urged downwardly toward the surface on which the carriage means 1 rides. The rigid member 84 fixedly carry a pair of stop members 85, respectively, which have bottom ends directed toward the arms 21 and respectively engaging the latter to limit the clockwise turning of the bell crank 80 to the position of these bell cranks indicated in FIG. 10.

The pressing means at the trailing end portions of the carriage means 1 further includes a series of pressing rolls 23 respectively formed with axial bores 23' through which the rod 22 freely passes. These bores 23' have a diameter substantially greater than the diameter of the rod 22 for a purpose described below. As is appar-

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ent from FIG. 2 each of the pressing rolls 23 has a cylindrical exterior surface and a pair of end faces which intersect the cylindrical surface at circular rounded edges 24 at the ends of each roll 23. In this way a sheet engaged by the pressing rolls will not be pinched between a pair of these rolls. Such pinching and undesirable creasing of the sheet might occur if the rolls had sharp end edges.

Referring to FIG. 1, the parts are shown therein in the position they take when the roll carried by the roll carrying means has been used up to such an extent that the bell cranks 80 have the angular position indicated in FIG. 10. However, it is apparent from FIG. 1 that when the roll of paper is thicker than shown in FIG. 1 the frame portion 2 will be directed upwardly to the left, as viewed in FIG. 1, and the weight of the entire carriage means will be carried in part by the wheel carrying axle means 12, 13 and in part by the roll of paper itself. In fact the center of gravity of the entire device is arranged relatively close to the roll carrying means 16—20 so that the paper is urged downwardly against the surface to be covered not only by its own weight and the weight of the roll carrying means 16—20, but also by a considerable part of the weight of the carriage means itself.

Furthermore, it will be noted that when the roll of paper is thicker than shown in FIG. 1 so that the frame portion 2 extends upwardly to the left, as viewed in FIG. 1, the arms 21 are spaced below the bottom ends of the stop members 85 and the springs 83 urge the rod 22 downwardly toward the paper which has just unrolled from the roll on the roll carrying means, this paper unrolling automatically during movement of the carriage means forwardly, which is to the right, as viewed in FIG. 1, so that at least some of the pressing rolls 23 are urged by the spring means 83 against the surface of the sheet which has just been unrolled. The upper surface of the sheet engaged by the series of pressing rolls 23 is generally irregular so that it has high spots and low spots. Those rolls 23 which happen to engage the high spots will be acted upon by the springs 83 while the other rolls 23 will press simply with their own weight on the sheet, and this result is brought about by the bores 23' which are substantially larger in diameter than the rod 22.

As the roll of the paper or the like carried by the roll carrying means continues to be unrolled during forward movement of the carriage means, the thickness of the roll diminishes and the bell crank 80 continuously turns in a clockwise direction, as viewed in FIG. 10. When the roll has been almost entirely consumed so that the parts have the position shown in FIG. 1 the arms 21 engage the stops 85 and beyond this point the pressing rolls 23 serve to support the carriage means together with the wheel carrying axle means 12, 13. Only during the final unrolling of the trailing end of the sheet is the carriage means 1 supported in part by the pressing rolls 23 which at this time still operate to press the sheet against the surface being covered. At all other times, when the roll is thicker than shown in FIG. 1, the major part of the weight of the carriage means presses down on the shafts 16 so that a strong pressure applies the sheet against the surface to be covered at the instant when the sheet contacts this surface, and this is true of almost the entire length of the sheet. As may be seen from FIG. 2 the pressing rolls 23 are relatively close to each other and extend across the entire width of the sheet to press the sheet against the surface to be covered immediately after the sheet has contacted the surface to be covered so that these pressing rolls in addition to providing a secure bond between the sheet and the surface it covers also smooth out wrinkles, if any.

A feeler means engages the rolled sheet at a portion thereof located just ahead of a portion of the sheet which is heated in a manner described below, and this feeler

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means is formed by a series of rollers 28 (FIG. 1) turnably supported by a rod 27 which is carried at its ends by a pair of arms 26 extending upwardly from the ends of the rod 27 at the sides of the carriage means, respectively. Those arms 26 form an arm means which carries the feeler means 28, and the arms 26 are pivotally connected by pivot pins 25 to the rear ends of the bars 6, as may be seen from FIG. 1. A spring means 30 in the form of a pair of springs 30 urges the arms 26 in a clockwise direction, as viewed in FIG. 1, so as to maintain the rollers 28 in engagement with the exterior surface of the roll of paper during the unrolling of the latter. The springs 30 are connected at one end to the arms 26, respectively, and at their opposite end to the cross bar 29.

A second arm means 32 is provided to support a heating means 33 described below. This second arm means is in the form of a pair of arms 32 pivotally connected at 31 to the bars 7, respectively, and having their bottom ends connected with the heating means 33 in a manner described below so as to carry the heating means 33.

This heating means 33 is in the form of an elongated hollow burner tube formed with a series of burner openings 34 shown in FIG. 2. As is apparent from FIG. 1, as the sheet is continuously unrolled it has at any given instant a surface portion located adjacent and directed downwardly toward a portion of the surface to be covered and about to move into contact with this portion of the surface to be covered, this portion of the sheet and the surface to be covered defining between themselves a gap which closes at the point of contact between the sheet and the surface to be covered and toward which the openings 34 of the burner tube 33 are directed so that the heating means serves to simultaneously heat a portion of the surface to be covered and a portion of the sheet just before these portions contact each other. A flexible conduit means 37 communicates with the heating means 33 for supplying to the latter a combustible fluid which can be ignited at the openings 34 and which escapes through the openings 34 to be burned at these openings, and in this way heat is applied to the sheet as well as the surface covered thereby. The combustible fluid may take the form of a liquefied gas or a combustible liquid.

In the illustrated example a pair of conduits 37 branch from a distributor valve 35 to spaced portions of the tube 33 so as to guarantee distribution of the combustible fluid along the entire length of the heating means. The wall of the heating means which is formed with openings 34 fixedly carries at its exterior surface spaced members 36 in the form of channels of substantially U-shaped cross section which cover openings 34 so that these openings are arranged in groups separated by the members 36. As a result, longitudinal portions of the sheet which are laterally spaced from each other and respectively aligned with the members 36 will not be heated and thus will not adhere to the surface to be covered. A means is provided for removably connecting the heating means 33 to the arm means 32 which carries the same so that one heating means may be exchanged for another, and this arrangement enables a heating means which is particularly suited for a particular job to be connected with the carriage means 1. An additional valve means 38 is located downstream of the distributor valve 35 for controlling the flow of combustible fluid through the conduits 37, and each conduit 37 may be associated with a separate ignition circuit for igniting the combustible fluid after it flows through each conduit 37 into the heating means 33.

Beneath the bars 7 are respectively located a pair of bars 41 each of which is connected as by welding at one end to a leg of frame member 5 and at an opposite end to one of the members 3. A shaft 40 extends between and is turnably supported by the bars 41, and this shaft 40 is fixedly connected adjacent the bars 41 to a pair of eccentric discs 39 which are fixed at portions adjacent their peripheries to the shaft 40. A pair of handle members 52 are fixed to the shaft 40 for turning the latter manually.

The discs 39 are respectively in the same planes as the arms 32 and when the shaft 40 is turned the discs 39 will have their peripheries brought into contact with the arms 32 to turn the latter in a counterclockwise direction, as viewed in FIG. 1, so that in this way the heating means 33 will be turned away from the heating position thereof indicated in FIG. 1 and thus it is possible to space the heating means from the roll of paper when the combustible fluid is first ignited, for example, or to exchange one heating means for another. During operation the eccentric discs 39 are out of contact with the arms 32 and in no way influence the latter.

A motion transmitting means interconnects the arm means 26 with the arm means 32 so that turning movement of the arm means 26 will be transmitted to the arm means 32. This motion transmitting means includes a pair of connecting rods 42 respectively connected pivotally at one end to the bars 26 and at an opposite end to the bars 32. Thus, turning movement of the arms 26 will be transmitted through the bars 42 to the arms 32. As the thickness of the roll diminishes during unrolling thereof, the feeler means 28 together with the arm means 32 will turn in a clockwise direction, as viewed in FIG. 1, and the arms 42 will transmit this movement to the arms 32 so that the latter will simultaneously turn in a clockwise direction, and the parts are so designed that the heating means 33 will in this way remain at all times at the same distance from the exterior surface of the sheet during unrolling of the latter so that uniform heating is guaranteed.

Preferably the elongated heating means 33 is angularly adjustable about its axis so that the angle of the burner openings 34 can be regulated. For this purpose (FIGS. 6-9) the end walls the heating means 33 is provided with respectively fixedly carry a pair of stub shafts 58 which are coaxial with each other and which respectively fixedly carry at their outer ends a pair of collars 59. The bottom ends of the arms 32 fixedly carry stub shafts 60 which are respectively directed toward and aligned coaxially with the stub shafts 58 when the burner means is connected with the carriage means. These stub shafts 60 respectively fixedly carry at their ends nearest to shafts 58 collars 61. While the collars 61 are of uniform thickness so that the end faces thereof are in parallel planes, each collar 59 has its annular end faces which is directed away from the adjacent collar 60 formed with a pair of helical steps each of which extends through approximately 180° with the thickest end of one step located next to the end of the next step which has the least thickness. These stepped surfaces are indicated at 67 and act as wedges. The face of each collar 59 which is directed toward the adjacent collar 61 is flat. Each collar 59 is formed with a pair of diametrically opposed notches 62 passing axially therethrough at the portions of least thickness thereof, and each collar 61 is formed with a pair of notches 63 adapted to be respectively aligned with the notches 62 during assembly of the heating means with the carriage means. A ring 64 surrounds each pair of cooperating collars 59 and 61. At its right side, as viewed in FIGS. 7-9, the ring 64 is formed with a pair of inwardly directed opposed teeth 65 which move through the aligned notches 62 and 63 during shifting movement of the ring 64 to the right from the position of FIG. 8 to that of FIG. 7. At its side opposite from the teeth 65 the ring 64 is provided with an inwardly directed annular flange 66 which engages the left end face of the collar 61 when the ring 64 is shifted from the position of FIG. 8 to that of FIG. 7. With the ring 64 in the position of FIG. 7 and the teeth 65 located at the parts of collar 59 which are of least thickness, the heating means 33 can be turned about its axis together with the rings 64 to set the angle of the burner openings 34, and then the ring 64 is turned with respect to the heating means so that the teeth 65 engage the wedge surfaces 67 to fix the heating means to the arms 32 in the adjusted angular posi-

tion. It is only to turn the rings 64 back to their starting position to loosen the connection so as to permit further adjustment of the angle of the heating means, if necessary, and then the rings 64 can again be tightened. Of course, the notches 62 must be turned into alignment with the notches 63 before the ring 64 can be shifted from the position of FIG. 7 to that of FIG. 8 to permit one heating means to be exchanged for another. Each ring 64 is provided at its outer surface with projections 68 which provide a secure grip for the operator.

Thus, the structure shown in FIGS. 6-9 and described above provides a means for releasably connecting the heating means 33 with the carriage means 1 and for adjusting the angle of the heating means.

Furthermore, as may be seen from FIG. 1, the arm means 32 together with the arm means 26, the motion transmitting means 42, and the feeler means 28 form a means responsive to the constantly diminishing thickness of the roll of paper for automatically maintaining the heating means 33 at the same distance from the exterior surface of the roll during the unrolling thereof.

As was pointed out above, the burner openings 34 are separated by elements 36 into groups which cause only longitudinally extending portions of the sheet to be heated. An additional means is provided for periodically interrupting the heating of the sheet during the unrolling thereof, so that as a result spaced rectangular portions of the sheet are heated. This interrupting means includes the screen 45 which is shown in FIG. 1 between the heating means 33 and the roll carrying means. When the screen 45 has the position shown in FIG. 1 it will prevent the heat from reaching the rolled sheet. This screen 45 is carried by a pair of levers 44 pivotally supported respectively on a pair of pivot pins 43 fixedly carried by the legs of frame member 5 adjacent the bottom ends of these legs. The right free ends of the levers 44 respectively rotatably carry rollers 47 which form cam followers and which respectively cooperate with a pair of cams 46 respectively fixed to the axle portions 12 for rotation therewith. A pair of springs 48 are connected with the levers 44, respectively as well as with the bottom portions of tubes 3 so as to maintain the cam followers 47 in engagement with the cams 46. Therefore, during movement of the carriage means 1 the cams 46 will move through a complete revolution during each revolution of the wheels 13 and as a result the screen 45 will interrupt the heating of the sheet once during each revolution of the wheels 13. The result is that the sheet which covers the surface to which it adheres has intersecting parallel portions which do not adhere to the covered surface and form with the lateral channels through which air may pass for cooling purposes, for example.

The frame members 4 and 5 of the carriage means 1 fixedly carry between themselves and at an elevation substantially higher than the lower frame portion 2 a framework 49 which carries a container 50 for the combustible fluid. A conduit 51 leads from the container 50 to the distributor valve 35 so that the fluid flows from container 50 through conduit 51 and then through valve 35 and 38 to the conduits 37.

The members 36 may, for example, have a length of 10 cm. so that the unheated longitudinal portions of the sheet are 10 cm. wide, and the device may include three members 36 spaced from each other along the heating means.

The sheet which is in the form of a roll on the roll carrying means may be a conventional tar paper or roofing paper provided at one or both of its surfaces with a coating of a suitable pitch or adhesive such as bitumen so that when this coating is heated by the heating means it will adhere to the surface to be covered. A first layer of this paper usually forms with its upper exposed surface the first surface to be covered, and this upper surface has a coating of bitumen or the like. Then a second layer covers the upper surface of the first layer in the manner

described above with the apparatus of the present invention, and the bitumen coatings on the surface to be covered as well as the surface of the covering sheet are simultaneously heated in the manner described above. All intermediate sheets of roofing paper have these adhesive coatings on both faces, and the last or topmost sheet need have the coating of bitumen only on its surface which is directed downwardly to be joined to the next lower sheet.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of sheet applying apparatus differing from the types described above.

While the invention has been illustrated and described as embodied in adhesive sheet applying apparatus, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a device for applying to a surface to be covered a sheet which adheres to said surface, in combination, carriage means movable along the surface to be covered; roll carrying means turnably supported by said carriage means for carrying a roll of the sheet to be applied to said surface so that during movement of said carriage means along said surface the sheet will unroll onto said surface, said roll carrying means supporting said roll in a position where at any given instant during movement of said carriage means and unrolling of said roll a surface portion of said roll is directed toward and about to move into contact with said surface and defines an elongated gap with said surface; heating means carried by said carriage means and extending along substantially the entire length of said roll carrying means for heating a sheet carried by the latter, said heating means being formed with burner openings which are directed toward said gap for simultaneously heating said surface as well as said sheet at the portion of the latter which is about to move in engagement with the portion of the surface heated by said heating means; and positioning means carried by said carriage means and being responsive to the thickness of the roll carried by said roll carrying means for automatically maintaining said heating means at a predetermined distance from the outer surface of the roll as the thickness thereof diminishes.

2. In a device for applying to a surface to be covered a sheet which adheres to said surface, in combination, carriage means movable along the surface to be covered; roll carrying means turnably supported by said carriage means for carrying a roll of the sheet to be applied to said surface so that during movement of said carriage means along said surface the sheet will unroll onto said surface; feeler means engaging the exterior surface of a roll carried by said roll carrying means; first arm means turnably connected with and carried by said carriage means and carrying said feeler means to support the latter in a position engaging the exterior surface of a roll carried by said roll carrying means as the thickness of the roll diminishes during movement of the carriage means along and the unrolling of said roll onto said surface; heating means extending along substantially the entire length of said roll carrying means for heating a roll carried thereby; second arm means turnably connected with and carried by said carriage means and carrying said heating means to

support the latter in a heating position with respect to the roll carried by said roll carrying means and motion transmitting means connecting said first arm means to said second arm means for turning the latter when said first arm means turns during unrolling of the roll, said motion transmitting means and second arm means cooperating to maintain said heating means in said heating position as the roll thickness diminishes.

3. In a device as recited in claim 2, spring means cooperating with said first arm means for urging the latter in a direction which maintains said feeler means in engagement with the roll carried by said roll carrying means.

4. In a device as recited in claim 2, manually operable means carried by said carriage means and cooperating with said second arm means for acting on the latter to move said heating means away from said heating position thereof.

5. In a device as recited in claim 4, said manually operable means including a disc supported eccentrically for turning movement by said carriage means and having a periphery in engagement with said second arm means so that when the operator turns said disc said second arm means turns to move the heating means toward or away from said heating position thereof.

6. In a device for applying to a surface to be covered a sheet which adheres to said surface, in combination, carriage means movable along the surface to be covered; roll carrying means turnably supported by said carriage means for carrying a roll of the sheet to be applied to said surface so that during movement of said carriage means along said surface the sheet will unroll onto said surface; heating means carried by said carriage means and extending along said roll carrying means for heating a sheet carried by the latter; screen means mounted on said carriage means for movement between an operative shielding position in which said screen means is located between said heating means and said sheet to prevent application of heat to the latter and an inoperative position located outside the space between said heating means and the sheet; and means cooperating with said screen means for moving the same between the positions thereof.

7. In a device as recited in claim 2, said feeler means engaging the exterior surface of a roll carried by said roll carrying means at a portion of said exterior surface which is just ahead of a portion of said exterior surface which is heated by said heating means.

8. In a device for applying to a surface to be covered a sheet which adheres to said surface, in combination, carriage means movable along the surface to be covered and including at least one rotatable axle and a wheel carried thereby; roll carrying means turnably supported by said carriage means for carrying a roll of the sheet to be applied to said surface so that during movement of the carriage means along said surface the sheet will unroll onto said surface; heating means carried by said carriage means and extending along said roll carrying means for heating a sheet carried by the latter; screen means mounted on said carriage means for movement between an operative shielding position in which said screen means is located between said heating means and said sheet to prevent application of heat to the latter and an inoperative position located outside the space between said heating means and the sheet; and transmission means between said axle and said screen means for moving the latter periodically between said positions thereof so as to periodically interrupt the application of heat to the sheet at a frequency which depends upon the rate at which the roll of said sheet is unrolled during movement of said carriage means along said surface.

9. In a device for applying to a surface to be covered a sheet which adheres to said surface, in combination, carriage means movable along the surface to be covered and including at least one rotatable axle and a wheel carried thereby; roll carrying means turnably supported by said carriage means for carrying a roll of the sheet to be

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applied to said surface so that during movement of the carriage means along said surface the sheet will unroll onto said surface; heating means carried by said carriage means and extending along said roll carrying means for heating a sheet carried by the latter; and interrupting means cooperating with the heating means for periodically interrupting the application of heat by said heating means to a sheet carried by said roll carrying means, said interrupting means including a screen located between said heating means and said roll carrying means, a lever carrying said screen and turnably connected with said

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carriage means, and a cam fixed to said axle for rotation therewith and acting on said lever for oscillating the latter and moving said screen to and from a position between said heating means and roll carrying means during movement of said carriage means along said surface and during unrolling of the sheet.

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