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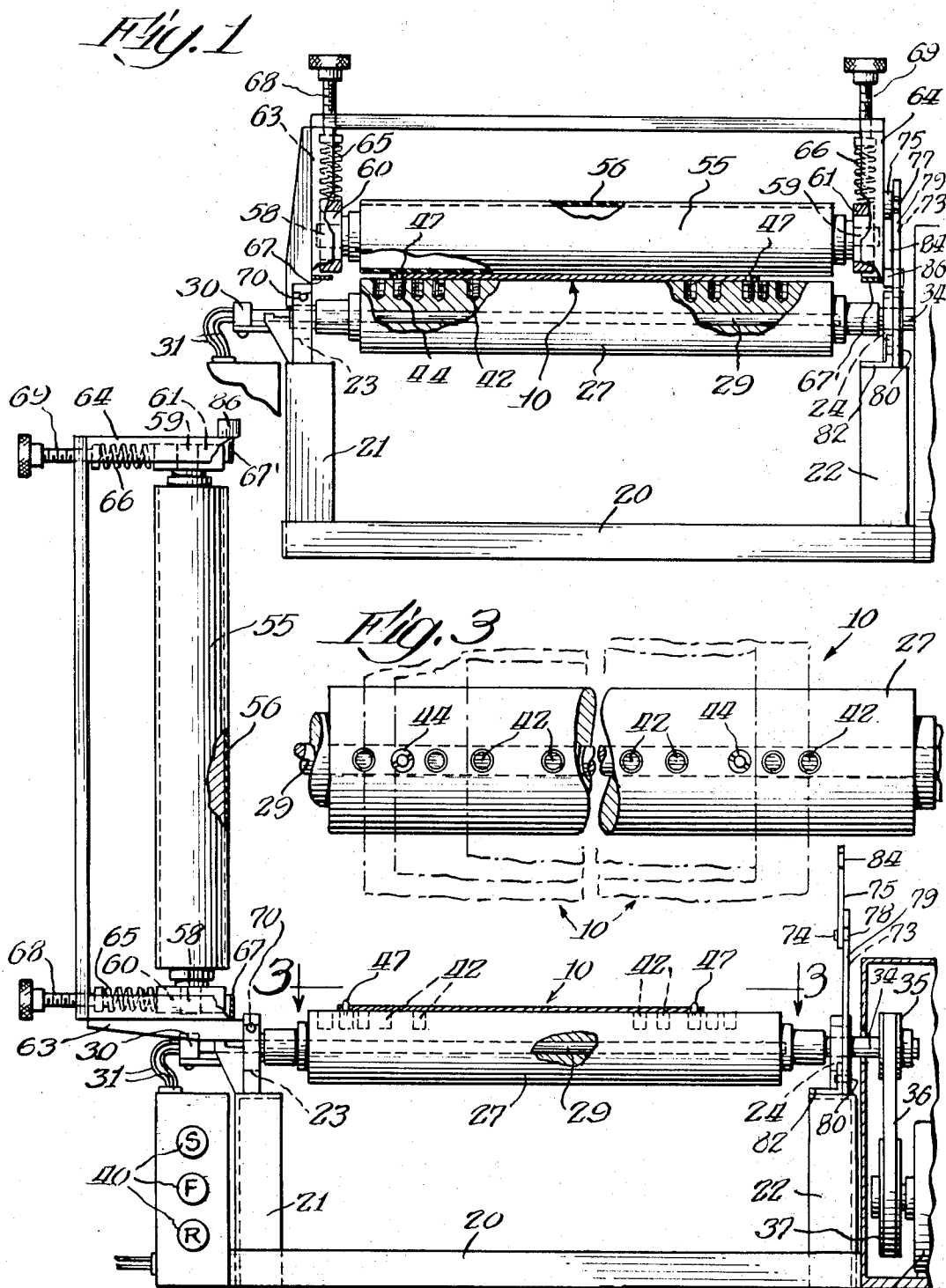
A. GRANDINETTI

3,531,361

PRINTING PLATE ASSEMBLY COMPACTING APPARATUS

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2 Sheets-Sheet 1



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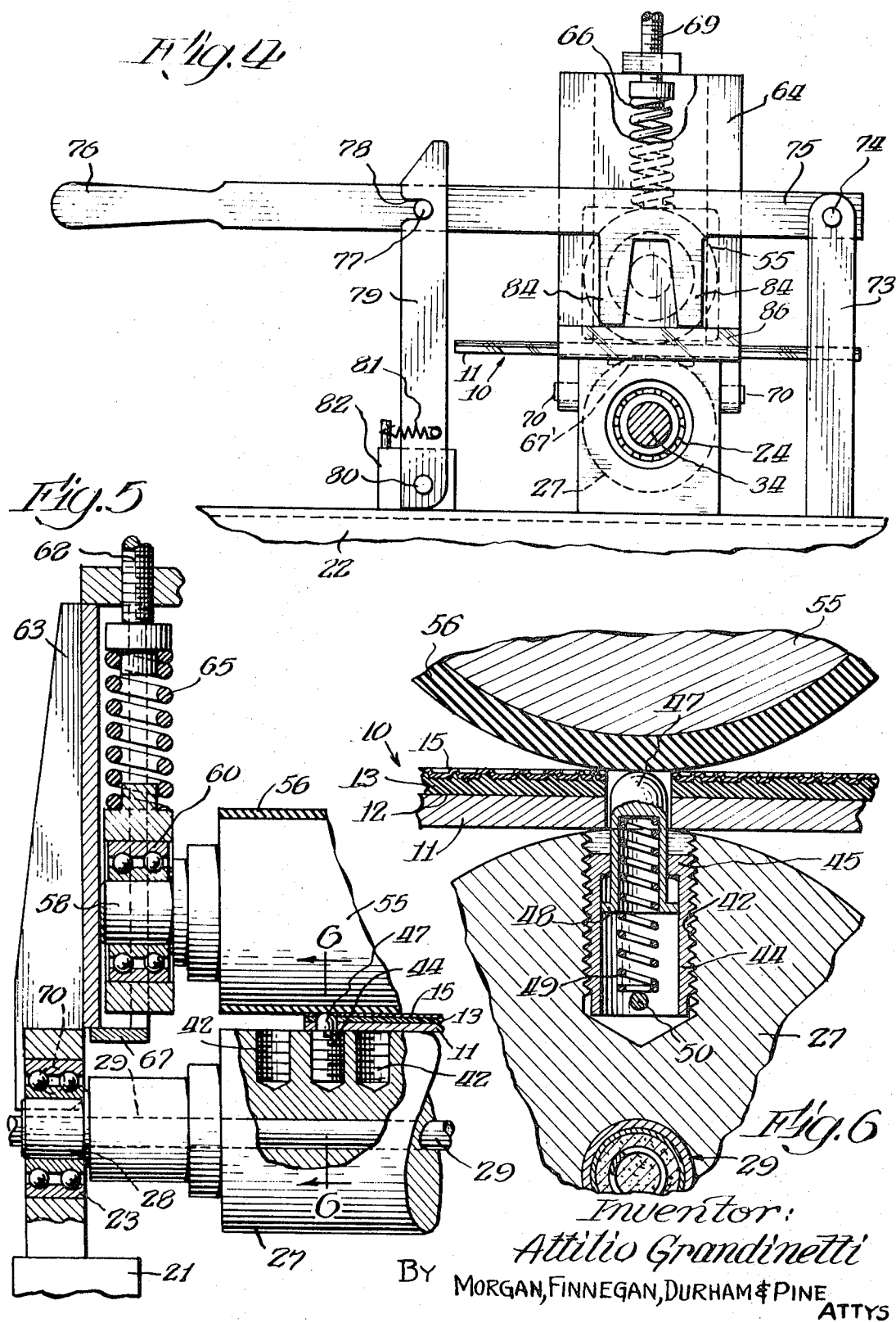
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PRINTING PLATE ASSEMBLY COMPACTING APPARATUS

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Original application June 2, 1964, Ser. No. 372,052, now Patent No. 3,484,326. Divided and this application Sept. 21, 1967, Ser. No. 679,953

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U.S. Cl. 156—582

2 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus for compacting layers of electrotype, backing material and a mounting plate into an integral printing plate assembly, wherein the compacting pressure is directed along a line extending across the printing plate components by means of an opposed pair of rotatable rollers maintained under a predetermined pressure, one of the rollers including retractable locating pins for locking the printing plate components against relative movement upon the initial application of pressure thereto by the pressure rollers. The rollers are selectively driven in both forward and reverse directions so as to move the line of compacting pressure therebetween from the point intermediate the ends of the components back and forth over the entire area of the assembly.

This application is a divisional of my copending application Ser. No. 372,052 filed June 2, 1964, now Pat. No. 3,484,326.

This invention relates to a method and apparatus for assembling a printing plate consisting of a thin electrotype, a metal backing member and an intervening bridging layer usually of plastic. Printing plates utilize an electrotype of copper or other material such as magnesium and is quite thin, of the order of about .008" to .012". Such an electrotype has its printing surface suitably embossed for printing purposes. Due to the thinness of material used, the rear or inactive face of the electrotype also has its surface indented. The pressure applied to the printing surface in connection with printing is such that the electrotype itself must be reinforced from the rear to prevent damage thereto.

In addition to the reinforcing action, a mounting plate, usually of aluminum, is provided for carrying the electrotype, the mounting plate functioning to permit locking of the electrotype in a desired position in a press. The supporting plate is of uniform gauge and has flat faces.

The assembly of plastic, electrotype and mounting plate together constitute a printing plate. The mounting plate itself can be of aluminum, as an example, and will have a thickness in the range of about .062" to .160". The overall thickness of the printing plate must be carefully controlled to meet press requirements. As a rule, the amount of plastic material between the electrotype and mounting plate is a factor in the overall thickness of the printing plate.

Where copper electrotypes are used, there is generally no problem involved in obtaining adherence between the plastic and copper surface. With aluminum, however, there is some difficulty in obtaining adherence of some plastics, particularly the preferred plastic used in this invention. Accordingly, a thin layer of cement which will adhere to both aluminum and the desired plastic can be used to obtain the desired adherence between the mounting plate and plastic. In the event that the electrotype metal is other than copper, and if difficulty is encountered in obtaining adherence to the desired plastic, then cement may also be used between the plastic and the electrotype surface.

Due to the small tolerances involved in the overall thickness of a printing plate and due to the necessity for securing good adherence between the various components of the printing plate, the means and method of assembling the same become important. It is essential that the assembly of the printing plate be accomplished without damage to the printing surface of the printing plate.

In accordance with the present invention, a simple and effective method of assembling such a printing plate is provided and a suitable means for practicing the method is also provided.

In order to integrate the printing plate components into a unitary structure, the invention provides for the application to the printing plate components of a uniform laminating pressure along substantially a straight line and moving the line of pressure application over the entire area of the printing plate. Any desired laminating pressure may be obtained without the use of a massive machine or device and without the necessity for creating a large total pressure over the entire area of the printing plate. Uniformity of laminating pressure for an entire plate is provided, whose value may be readily varied to suit individual plate requirements. Because of the precise control over the laminating pressure which is possible by the new method and apparatus, the desired overall thickness of the printing plate can be accurately maintained. This is due to the fact that plastic between the outer components of the printing plate may have some tendency to flow. Thus if the laminating pressure at any particular part of the printing plate is different from the pressure at other parts, there may be sufficient differences in the overall thickness at various points of the entire printing plate to create printing difficulties.

In order that the invention may be fully disclosed, a detailed description thereof will now be given in connection with the drawings wherein:

FIG. 1 is a front elevation, with certain parts broken away, illustrating a machine embodying the present invention for practicing the new method and assembling the components of a printing plate.

FIG. 2 is a view showing the machine of FIG. 1 with the top roller and support swung into inoperative position.

FIG. 3 is a detail on line 3—3 of FIG. 2 illustrating the pattern of locking members so that various sizes of printing plates may be accommodated.

FIG. 4 is an end view of the machine illustrated in FIG. 1, this view illustrating the locking means for maintaining the rollers in predetermined operative position.

FIG. 5 is an enlarged detail illustrating the supports for one end of each of the rollers.

FIG. 6 is an enlarged detail on line 6—6 of FIG. 5.

Before proceeding to describe the machine and method, a brief description of the printing plate components will be given.

Referring to FIG. 6, a printing plate generally indicated by 10 comprises a metal support plate 11, usually of aluminum, cemented by a suitable adhesive at region 12 to layer 13. Epoxy resin cements or rubber-based resin cements are available for such purposes. Layer 13 is preferably of plastic having suitably desirable mechanical properties for fulfilling the desired function. The plastic used may either be thermo-setting or thermo-plastic. Preferably, thermo-plastic materials are used. A preferred plastic is the so called ABS polymers (acrylonitrile-butadiene-styrene). For example, such a plastic is manufactured and sold by the Marbon Chemical Division of Borg-Warner Corporation under the trademark "Cycloc" and by the United States Rubber Company under the trademark "Kralastac." The ABS polymers are characterized by good moulding ability, good hardness, high impact strength under room temperatures, toughness, good flow

characteristics, high tensile strength, low specific gravity and a high degree of rigidity.

Plastic layer 13 is cast to the inner surface of electrotype 15. Electrotype 15, if made of copper, provides good adherence to the plastic and fills the irregular surface of the rear or inactive face of the electrotype. As a rule, plastic layer 13 is cast over electrotype 15 in a suitable mould. The smooth face of plastic layer 13 is obtained by a machining operation upon the plastic layer after the same has set. The machining operation provides a smooth surface and permits the overall thickness of electrotype 15 and plastic layer 13 to be accurately determined. The thickness of support plate 11 can also be accurately controlled by supplying the proper gauge of metal. It is thus possible to control the overall thickness of printing plate 10 to within less than about one mil (.001").

It is important that the entire printing plate be compacted to provide an integral structure. The printing plate itself may either be flat or may be curved, with the electrotype surface being convex.

The new device for handling the printing plate components comprises base 20 having standards 21 and 22. Standards 21 and 22 carry bearings 23 and 24 of any suitable type. As illustrated here, the bearings are of the ball-bearing type. However, other bearings of simple journal type may be used.

Rotatably supported in bearings 23 and 24 is lower roller 27 of cylindrical construction, preferably of steel or similar rigid material. Roller 27 has one end reduced to provide sleeve portion 28 within bearing 23. Disposed within the roller axially thereof is non-rotatable electric heating element 29. Heating element 29 is of the metal-clad type such as are used in domestic electric stoves, and extends beyond one bearing—in this instance, 23—to connector structure 30 having electric power supply wires 31 going thereto.

Heating element 29 is stationary and may be provided with a thermostat for controlling the operating temperature of the heating element. Heating element 29 has a smooth finish to reduce friction against the roller. Roller structure 27 is rotatable about heating element 29. End portion 34 of roller 27 extends beyond bearing 24 and carries pulley 35. Pulley 35 is driven by belt 36 from drive pulley 37 on electric motor 38. Electric motor 38 is controlled by switch buttons 40 for stopping, forward, or reverse motor rotation.

Roller 27 has a length equal to the maximum width of any printing plate to be handled. The diameter of roller 27 may be of the order of several inches and, in any event, is much less than the diameter of any printing press cylinder for carrying printing plate 10. In order to accommodate various widths of printing plates, roller 27 has a plurality of tapped recesses 42, each recess 42 extending radially of the cylinder. As illustrated in the drawings, recesses 42 are disposed at spaced intervals along a line parallel to the cylinder axis. This disposition of recesses is for convenience. In practice, two recesses will cooperate as a pair and be independent of the other recesses. For example, referring to FIG. 3, the very end recesses will cooperate at one pair; the next recesses will cooperate as a second pair, etc. It is not necessary that one pair of recesses be aligned with any other pair of recesses.

Disposed in a recess is locating member, shown in enlarged form in FIG. 6. The locating member comprises externally threaded sleeve 44 with apertured end wall 45. Slidably disposed within sleeve 44 is hollow pin 47 having externally extending shoulder for limiting the outward movement of pin 47 from sleeve 44. Disposed within pin 47 is coil spring 49, one end of which bears against the head of pin 47 and the other end of which bears against transverse pin 50 carried by sleeve 44. The arrangement is such that pin 47 can, if necessary, be pushed against spring 49 so that the entire pin is within the outline of roller 27. It is thus possible to have locating pins in every recess 42.

As illustrated in FIG. 3, any printing plate which is so wide as to extend beyond a locating pin can clear a pin by forcing the pin down into the sleeve. Support plate 11 has notches at each side thereof for engagement with a pair of pins properly spaced for the particular width of the printing plate. The locating pins 47 are used for the purpose of initially locating the parts of the printing plate at the beginning of an operation. As is indicated in FIG. 6, the locating notches at the sides of support plate 11 also extend through plastic layer 13 and the sides of electrotype 15. This, however, is not essential.

Cooperating with roller 27 is top roller 55. Top roller 55 preferably has outer layer 56 of rubber of sufficient flexibility to yield somewhat when cooperating with the active or printing face of electrotype 15. The roller has reduced portions 58 and 59 which are carried in floating bearings 60 and 61. Bearings 60 and 61 are mounted for movement in guide structures 63 and 64. Guide structures 63 and 64 have springs 65 and 66 for applying pressure to bearings 60 and 61, thus applying pressure on roller 55. Bolt means 68 and 69 are provided for adjusting the compression of springs 65 and 66, the general arrangement being similar to a conventional clothes wringer.

Guide structures 63 and 64 are each provided with stops 67 and 67' to limit the travel of floating bearings 60 and 61 in response to compression of springs 65 and 66. The guide structures have top portions containing the top ends of springs 65 and 66.

Top roller 55, together with its bearing supports, and spring compression means are pivotally secured at 70 above standard 21 to permit the top roller structure as a whole to be swung clear of bottom roller 27 to the inoperative position illustrated in FIG. 2. Means are provided for maintaining the top roller structure in the operating position illustrated in FIG. 1. This comprises post 73 adjacent standard 22. Post 73 has pivotally secured thereto at 74 locking lever 75 having operating handle 76. Locking lever 75 carries locking pin 77 which is adapted to be positioned in slot 78 of detent arm 79. Detent arm 79 extends downwardly to standard 22 and is pivotally secured thereto at 80. Spring 81 attached to a pin on detent arm 79 and to bracket part 82 of standard 22 normally maintains detent arm 79 in the locking position illustrated in FIG. 4.

Locking lever 75 has portion 84 extending downwardly as seen in FIG. 4 to engage stop portion 86 carried by guide portion 64. Upon release of lever 75, permitting this lever to swing up around pin 74 as seen in FIG. 4, the top roller structure will be free to move up to the position illustrated in FIG. 2.

To use the machine so far described, the top roller is moved to the position illustrated in FIG. 2. The printing plate components are positioned so that a pair of locking pins 47 engages the centrally disposed holes or notches in the two sides of the support plate. Thereupon, the top roller assembly is moved down into locked position and after proper adjustment of the roller pressure, the motor is activated to turn roller 27. It is understood that the printing plate components are assembled so that the electrotype faces the rubber-faced roller. Preferably, the speed of rotation of the rollers is slow enough so that an operator can stop the motor when the rollers have moved the printing plate almost to one end position. Thereafter, the motor is reversed and the rollers move the plate to the other end position. Preferably, when the other end position has been reached (the printing plate is still between the rollers), the motor is again reversed to bring the compacted plate to the starting or center position. Then the top roller is unlocked and the finished printing plate removed.

The cycle of operation may be controlled automatically by limit switches which will reverse the electric motor at one end and the other end of the printing plate movement and will stop the motor in the center after the second reversal.

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By starting the compacting operation along the center line of the printing plate, there will be substantially no tendency for any lateral shifting of the printing plate components. After the initial compacting, the elements along the center line between locating slots are tight enough so that upon movement of the elements away from the locating pins, there will be no longitudinal relative shifting of components. The printing plates may be quickly processed. It will be evident that the comparatively narrow area at which pressure is exerted upon the printing plate assembly at any one time makes possible highly accurate compacted pressure control and at the same time insures uniformity of pressure along both dimensions of the plate. The finished item is accurate in regard to thickness. The device for compacting the components of the printing plate can accommodate a large variety of printing plates, not only with respect to width and length, but also with respect to curvature. It is thus clear that a versatile and convenient means for compacting printing plates is provided.

Instead of plastic layer 13, it is possible to use a low melting alloy or metal such as lead. The lead would be cast against the reverse or inactive face of the electrotype, and the lead surface where it would be cemented to the aluminum support plate would be machined or finished to a smooth surface having a desired overall thickness for both the lead and electrotype.

Instead of aluminum for support plate 11, any suitable rigid material—metal or plastic—may be used.

What is claimed is:

1. Apparatus for compacting layers of electrotype, backing material and a rigid supporting plate into an integral printing plate assembly, comprising:

a first rotatably mounted roller;

a second rotatably mounted roller;

said second roller having a resilient surface covering adapted to engage the printing surface of said electrotype component of said printing plate assembly;

means for mounting said second roller for pivotal movement from a laterally offset inoperative position with respect to said first roller to an operative position wherein said first and second rollers are in direct, opposed alignment;

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locking means for maintaining said second roller in said operative position of direct, opposed alignment with respect to said first roller;

spring means for urging said first and second rollers together under pressure of predetermined value when said rollers are in said operative position of direct, opposed alignment so as to develop a straight line of compacting pressure therebetween;

a plurality of retractable locating pins carried by one of said rollers, two of said pins adapted to engage a pair of opposed, correspondingly-shaped slots provided along opposite edges of said assembly to thereby locate said assembly between said first and second rollers and lock the assembly components against relative movement while pressure is applied thereto by said rollers; and

means for selectively driving said first roller for rotation in both forward and reverse directions,

whereby said pressure rollers are adapted to exert said line of compacting pressure on said assembly components initially at a point intermediate the ends thereof and as said rollers alternately turn in forward and reverse directions, to thereafter move said line of compacting pressure back and forth over the entire area of said assembly.

2. The construction according to claim 1 wherein means are provided for heating said first roller, said heating means comprising a stationary cylindrical electric heating element disposed within said first roller and coaxial therewith.

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