A sealing machine for sealing plant material disposed within a heat-sensitive bag comprises a first platen, a second platen movable with respect to the first platen between open and closed positions, and a compressible member disposed in a gap between said first and second platens. As the second member moves towards the closed position, the compressible member contacts and applies a pressure to the bag, and evacuates substantially all of the air from within the bag without damaging the plant material. A sealing strip heats the bag, while an opposing pressure strip directs a pressure to the bag.
FIG. 5
SYSTEM AND METHOD FOR VACUUM PACKAGING GOODS

BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to packaging devices, and particularly to devices used to vacuum package plant material within a heat-sensitive bag.

[0002] Vacuum packaging is a process that permits vendors, particularly those of perishable goods, to substantially reduce shipping size, extend the shelf life of their products, and optimize profits. Typically, the goods are disposed within a heat-sensitive bag, and a pressure is applied to force the air out of the bag. Once the air is evacuated from the bag, an open end of the bag is heat-sealed to prevent the goods from fouling.

[0003] Despite the benefits, however, the process may actually be damaging to some of the more fragile perishables. For example, current devices may employ pressures that can break or crush plant material, such as ferns and other plants used in the floral industry. As customers generally do not purchase floral arrangements having crushed or broken plants, either the florists must dispose of the broken pieces, or their suppliers must ship plant material that is not vacuum packed. Thus, some industries may not be able to realize the advantages offered by vacuum packaging. Accordingly, there remains a need for a method and device that can vacuum-pack perishable materials without damaging the materials.

SUMMARY OF THE INVENTION

[0004] The present invention relates to a method and apparatus of sealing plant material within a heat-sensitive bag without damaging the plant material. In one embodiment, the apparatus comprises a first platen, a second platen movable with respect to the first platen between open and closed positions, a gap between the first and second platens when the second platen is in the closed position, and a compressible member disposed in the gap. The plant material within the bag is positioned on the first platen, and the second platen is moved towards the bag. The compressible member contacts and applies pressure to the bag, which evacuates substantially all of the air from within the bag while limiting the maximum amount of pressure applied to the plant material. This prevents damage to the plant material. A sealing strip then cooperates with an opposing pressure strip to seal the bag.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. 1 illustrates one embodiment of the present invention.

[0006] FIG. 2 illustrates sealing plant material within a bag according to one embodiment of the present invention.

[0007] FIG. 3 illustrates an alternate embodiment of the present invention.

[0008] FIG. 4 illustrates sealing plant material within a bag according to an alternate embodiment of the present invention.

[0009] FIG. 5 illustrates an exemplary sealed product wherein floral plant material has been sealed within a bag using the method and apparatus of one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0010] Referring now to FIG. 1, one embodiment of the sealing machine of the present invention is shown therein, and indicated generally by the number 10. In this embodiment, scaling machine 10 is used to seal an object in a bag, for example, plant material 12 in bag 14. Scaling machine 10 comprises a first platen 16, a second platen 18, a compressible member 20, a pressure strip 24, and an opposing sealing strip 26. One or more hinges 28 may connect the first and second platens 16, 18, while electrical control 30 and foot pedal 32 control the operation of the sealing machine 10.

[0011] The bag 14 may be made of any variety of flexible, plastic film. Plastics such as polyethylene, polypropylene, polyvinylchloride, or polystyrene, as well as any other type of material known in the art, are sufficient for use in the construction of bag 14. Further, bag 14 may be of any thickness to provide the desired rigidity, resistance to puncture, and optimum gas exchange through the walls of bag 14.

[0012] Electrical control 30 connects via power cord 34 to an external power source (not shown), and provides power to heat the sealing strip 26 and operate the first and second platens 16, 18. A control knob 36 located on the front panel of electrical control 30 allows a user to adjust the amount of pressure and/or temperature applied to the plant material 12 and bag 14, respectively, while gauge 38 permits the user to monitor the pressure and/or temperature. In one embodiment, electrical control 30 comprises an 800-Watt transformer, but those skilled in the art will readily appreciate that electrical control 30 may comprise any component known in the art that will provide regulated power.

[0013] Foot pedal 32 operatively connects to one or more fluid cylinders 40, which, in turn, connect to an external compressor (not shown) via hose 42. When the user depresses foot pedal 32, the external compressor causes the fluid cylinders 40 to move the second platen 18 into the closed position. Conversely, releasing foot pedal 32 causes the second platen 18 to move into the closed position.

[0014] The fluid cylinders 40 are pneumatic cylinders capable of providing up to about 100 psi. A pressure relief valve (not shown) disposed on each fluid cylinder 40 regulates the maximum amount of pressure, and helps prevent damage to the fluid cylinders 40 due to repeated pressure buildup. The pressure relief valve also enables the fluid cylinders 40 to provide the rated pressing force (e.g., 100 psi), and finish with a zero-compression ratio when bag 14 is sealed. However, the present invention is not limited merely to using pneumatic cylinders rated at 100 psi. Those skilled in the art will readily appreciate that the fluid cylinders 40 may also be hydraulic cylinders, for example, and further, rated for any pressure desired. As will be explained later in more detail, the compressible member 20 will prevent damage to the plant material, regardless of the amount of force applied by fluid cylinders 40.

[0015] Sealing strip 26 may be constructed from a nichrome base with a copper and ceramic strip, and is dimensioned to provide heat over an area sufficient to seal bag 14. For example, the embodiment of FIG. 1 illustrates the sealing strip 26 as approximately 1 cm. wide and integrally formed along an edge of first platen 16. Alternatively, however, sealing strip 26 may be integrally formed
along an edge of second platen 18. In fact, as will be described later in more detail, sealing strip 26 need not be attached to the first or second platens 16, 18, but instead, exist as a separate entity distinct from the first and second platens 16, 18. Thus, those skilled in the art will readily appreciate that the size, configuration, and materials used in the construction of sealing strip 26 may vary.

[0016] As stated above, electrical control 30 provides power to heat the sealing strip 26. Further, the user may vary and monitor the temperature of the sealing strip 26 via control knobs 36 and gauge 38. Thus, the user may raise or lower the temperature of the sealing strip 26 as needed. In FIG. 1, the temperature may vary anywhere from 0° Celsius (e.g., when the sealing strip 26 is turned off) to about 100° Celsius, and typically ranges from about 40° Celsius to about 90° Celsius in operation. A temperature of about 60° Celsius applied for about 5 seconds, however, should be sufficient with which to seal bag 14 shown in FIG. 1. Of course, as the present invention is not limited to the use of any one type of bag 14, it is also not limited to any single range of temperatures. That is, sealing strip 26 may be controlled to heat to any temperature, dictated for example, by the specific properties of whatever bag 14 is employed.

[0017] Pressure strip 24 may comprise a hardend bar of material, such as wood, metal, or metal alloy, but other materials may also be used. For example, foam having various densities, and rubber, are materials that are equally sufficient with which to construct the pressure strip 24. Whatever the material used, however, should be of a sufficient hardness to permit the user to apply prolonged pressure to bag 14 without tearing the bag 14. A leather or vinyl cover may cover part or substantially all of pressure strip 24 to help prevent damage to the bag 14.

[0018] The pressure strip 24 of FIG. 1 opposes the sealing strip 26. Like sealing strip 26, pressure strip 24 may be integrally formed along the edge of the second platen 18, the first platen 16, or exist separately from the first and second platens 16, 18 altogether. Whatever the configuration, pressure strip 24 should oppose sealing strip 26 to provide the requisite pressure to the selected portion of the bag 14 disposed on sealing strip 26. In FIG. 1, pressure strip 24 lowers in concert with the second platen 18, and remains in contact with the selected portion of the bag 14 for as long as the second platen 18 remains in a closed position. While the time required for sealing bag 14 may depend on such factors as the properties of the bag 14 (e.g., thickness, material, etc.), and amount of heat applied to the bag 14, it is generally within the range of about 1-20 seconds, and typically within the range of 1-10 seconds.

[0019] Compressible member 20 is disposed in the gap 22 formed between the first and second platens 16, 18 when the second platen is in the closed position (FIG. 2). Preferably, compressible member 20 is constructed of a pliable, resilient material of sufficient density able to withstand the compressions and decompressions associated with the repeated opening and closing of the first and second platens 16, 18. Compressible member 20 prevents damaging the plant material 12 within bag 14 during the packaging process, while still providing sufficient pressure with which to evacuate the air from within the bag 14. This ability to protect plant material 12 is, of course, irrespective of the amount of force with which fluid cylinders 40 may operate.

[0020] For example, in one embodiment, the fluid cylinders 40 operate at pressures of about 100 psi to move the second platen 18 towards the closed position. As the compressible member 20 contacts the bag 14, it evacuates substantially all of the air from within the bag 14, and collapses around the plant material 12 thereby preventing the plant material 12 from being crushed. Thus, the compressible member 20 limits the maximum amount of force applied to the plant material 12 within bag 14. While the maximum amount of force may vary according to the device, or type of compressible member 20, in one embodiment the maximum amount of force is limited to the range of about 5 lbs. per square inch to about 20 lbs. per square inch.

[0021] FIG. 1 illustrates compressible member 20 attached to the second platen 18, but may alternatively be attached to the first platen 16. Attachment may be accomplished using any means known in the art including, but not limited to, glue and mechanical fasteners. Further, the present invention is not limited to the use of a single compressible member 20, but also may include a second compressible member (not shown). In this embodiment, each of the first and second platens 16, 18 could include a compressible member 20 attached to it. Whatever the number of compressible members 20 used, however, they operate to limit the maximum amount of force applied to the plant material 12 when the second platen 18 is in the closed position, and thus, prohibits damage to the plant material 12.

[0022] In operation, the user places plant material 12 within bag 14. Typically, bag 14 has already been sealed on three sides; however, those skilled in the art will realize that “pre-sealing” bag 14 is not necessary. In fact, plant material 12 may be simply disposed between two sheets of material, and the sealing machine 10 of the present invention used to seal all the sides. Further, the user has already adjusted the temperature of sealing strip 26 and/or the amount of pressure applied by cylinders 40 using electrical control 30, but this is not necessary.

[0023] The plant material 12 within bag 14 is disposed on the surface of first platen 16, and positioned such that a portion of the open end of bag 14 lies outside of the confines of the compressible member 20 and over sealing strip 26. As seen in FIG. 1, the plant material 12 lies completely within the confines of the compressible member 20, such that compressible member 20 will completely envelop plant material 12 when the second platen 18 closes.

[0024] Once positioned, the user depresses foot pedal 32, which operates the fluid cylinders 40 to move the second platen 18 from the open position to the closed position, as seen in FIG. 2. As the second platen 18 closes, compressible member 20 presses down on the plant material 12 within bag 14, and causes substantially all the air to evacuate through and out the open end of bag 14. In accordance with the present invention, compressible member 20 collapses around plant material 12, thereby limiting the maximum amount of applied pressure and prohibiting any damage to the plant material 12.

[0025] When the second platen 18 reaches the fully closed position, the pressure strip 24 contacts and applies pressure across the selected portion of bag 14 that extends over the heated sealing strip 26. The pressure strip 24 may be slightly offset from the plane of the second platen 18 to compensate
for the gap 22 that is formed when the second platen 18 fully closes. In this embodiment, the sealing strip 26 is heated to about 60° Celsius, and the second platen 18 remains in the closed position for about 5 seconds to seal the open end of bag 14. However, no substantial amount of heat is ever transferred to the plant material 12 within the bag 14. When complete, the user releases foot pedal 32, and second platen 18 returns to the open position. Thus, the open end of the bag 14 is sealed, ambient air is substantially prevented from entering the inside of bag 14, and the plant material 12 within bag 14 remains free from damage presenting a substantially vacuum-packed appearance.

[0026] FIG. 3 illustrates an alternate embodiment of the present invention, which employs neither fluid cylinders 40, nor a foot pedal 32 to operate the first and second platens 16, 18. Instead, the user manually moves the second platen 18 from the open position to the closed position. Further, both the sealing strip 26 and the pressure strip 24 are associated with a heating unit 44, and are separate from the first and second platens 16, 18. Accordingly, neither the sealing strip 26 nor the pressure strip 24 move with the second platen 18. Like electrical control 30, heating unit 44 connects to a power source (not shown), and regulates the temperature of the sealing strip 26. As in the previous embodiments, plant material 12 disposed within bag 14 placed on the first platen 16 with an open end of bag 14 placed over the sealing strip 26, such that compressible member 20 will envelop plant material 12 when the second platen 18 is fully closed.

[0027] As seen in FIG. 4, the user operates sealing machine 10 by manually lowering the second platen 18. Compressible member 20 pressingly engages the plant material 12, and substantially evacuates all of the air through and out the open end of bag 14. As compressible member 20 contacts the plant material 12, it limits the maximum amount of applied force and protects the plant material 12 from damage. To seal the open end of bag 14, the user manually lowers pressure strip 24 onto the selected portion of bag 14 that lies over the sealing strip 26, and applies pressure until a gap between said first and said second platens when said second platen 18, and removes plant material 12 within sealed bag 14 from sealing machine 10.

[0028] FIG. 5 illustrates one embodiment of a sealed product 50, wherein plant material 12 has been sealed within bag 14 using one embodiment of the present invention. For illustrative purposes, the plant material 12 in FIG. 5 comprises a fern bunch, however, those skilled in the art will readily appreciate that floral product 50 may alternately comprise a floral arrangement, greenery, or other floral plant material typically used in the floral industry. As seen in FIG. 5, the plant material 12 lies completely within the interior volume of the sealed bag 14. Further, as the compressible member 20 limits the maximum amount of force applied to plant material 12 during the sealing process, floral product 50 has a substantially vacuum-packed appearance. That is, the force applied by compressible member 20 evacuates a substantial amount of the air contained within the interior volume of the bag 14, although it should be noted that at least some air may remain within the interior volume of bag 14 even after sealing. However, even though the plant material 12 has been subjected to some amount of force, the fragile leaves and stems of plant material 12 have not been substantially crushed or damaged. Thus, the present invention permits the sealed product 50 to enjoy a much longer shelf life than plants that are not packed and sealed according to the present invention.

[0029] As those skilled in the art will readily appreciate, many variations can readily be applied to the present invention without departing from the essential characteristics. For example, the embodiments shown in the Figures depict second platen 18 moving into pressing engagement with plant material 12 positioned on first platen 14, however, the present invention also contemplates embodiments wherein both first and second platens 16, 18 move towards each other. As such, there is no requirement that the first and second platens 16, 18 be hingedly attached. Moreover, the figures illustrate compressible member 20 as a single-piece foam pad however, any materials known in the art may suffice, and compressible member(s) 20 may comprise a single-piece or a plurality of separate pieces. The only requirement is that the material used for compressible member 20 substantially protects the object during the packaging process, and limit the maximum amount of pressure applied to the object. Finally, while plant material 12 is used to illustrate the exemplary embodiments, those skilled in the art will understand that any material, fragile or not, may be sealed using the sealing machine 10 of the present invention.

[0030] Accordingly, the present invention may be carried out in other specific ways than those set forth herein without departing from the essential characteristics of the invention. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

What is claimed is:

1. A sealing machine for sealing plant material within a bag comprising:
   - a first platen;
   - a second platen movably with respect to said first platen between open and closed positions;
   - a gap between said first and said second platens when said second platen assumes the closed position;
   - a sealing strip to heat the bag and seal the plant material within the bag; and
   - a compressible member disposed in said gap between said first and second platens, said compressible member contacting the bag and applying pressure to the bag to substantially evacuate air from within the bag without damaging the plant material within the bag.

2. The sealing machine of claim 1 wherein said first and second platens are hingedly attached.

3. The sealing machine of claim 1 further comprising a heating unit, wherein said sealing strip is operatively connected to said heating unit.

4. The sealing machine of claim 3 further comprising a pressure strip that opposes said sealing strip, said pressure strip contacting and applying pressure to the bag.

5. The sealing machine of claim 4 wherein said heating unit is operable to heat said sealing strip to a range of about 40° C. to about 100° C.

6. The sealing machine of claim 1 wherein said compressible member limits the maximum amount of pressure
applied to the plant material in the bag to a range of about 5 lbs. per square inch to about 20 lbs. per square inch.

7. The sealing machine of claim 1 further comprising a fluid cylinder, said fluid cylinder moving said second platen into pressing engagement with said first platen.

8. The sealing machine of claim 7 wherein said fluid cylinder is a pneumatic cylinder.

9. The sealing machine of claim 1 wherein said compressible member comprises a foam pad.

10. A method of sealing a bag containing plant material, said method comprising:

forming a gap between a first platen and a second platen, said second platen being movable with respect to said first platen between open and closed positions;

applying pressure to the plant material within the bag with a compressible member disposed in said gap, such that the pressure evacuates substantially all of the air from the bag without damaging the plant material within the bag;

sealing the plant material within the bag by heating the bag.

11. The method of claim 10 wherein applying pressure to the plant material within the bag comprises moving said second platen towards the closed position.

12. The method of claim 11 wherein moving said second platen towards the closed position includes actuating a fluid cylinder operatively connected to said second platen.

13. The method of claim 10 wherein applying pressure to the plant material within the bag comprises limiting the maximum amount of pressure applied to the plant material with said compressible member is within the range of about 5 lbs. per square inch to about 20 lbs. per square inch.

14. The method of claim 13 wherein the maximum amount of pressure applied to the plant material with said compressible member is within the range of about 5 lbs. per square inch to about 20 lbs. per square inch.

15. The method of claim 10 wherein sealing the plant material within the bag comprises disposing a selected portion of the bag over said sealing strip.

16. The method of claim 15 wherein sealing the plant material within the bag further comprises heating the sealing strip to a temperature within a range of about 40°C to 90°C.

17. The method of claim 16 wherein sealing the plant material within the bag further comprises directing a pressure on said selected portion of the bag for a period of about 1 second to about 10 seconds.

18. A packed floral product comprising:

a bag;

a floral plant sealed within the bag; and

the bag being substantially evacuated of air such that the packed floral product has a substantially vacuum-packed appearance.

19. The packed floral product of claim 18 wherein the floral plant material comprises greenery.

20. The packed floral product of claim 18 wherein the greenery is a fern bunch.

21. The packed floral product claim 18 wherein the floral plant material is a floral arrangement.

22. The packed floral product of claim 18 wherein substantially all of the air within the bag is evacuated by:

forming a gap between a first platen and a second platen, the second platen being movable with respect to the first platen between open and closed positions;

applying pressure to the floral plant within the bag with a compressible member disposed in the gap, such that the pressure evacuates substantially all of the air from within the bag without damaging the floral plant; and

sealing the floral plant within the bag by heating the bag.

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