United States Patent [19]

Jinotti

[11] **3,902,635**

[45] **Sept. 2, 1975**

[54] **FLUID DISPENSING APPARATUS**

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[21] Appl. No.: **466,883**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 338,295, March 5, 1973, abandoned.

[52] **U.S. Cl.** ..... **222/103;** 222/146 HE; 222/340; 222/386

[51] **Int. Cl.**[2] **B65D 35/30**

[58] **Field of Search** ..... 222/386, 390, 146 H, 222/146 HE, 222/340, 341, 95, 103, 105, 387; 128/DIG. 12, 214.2, 214 A, 214 F; 100/240, 295, 265

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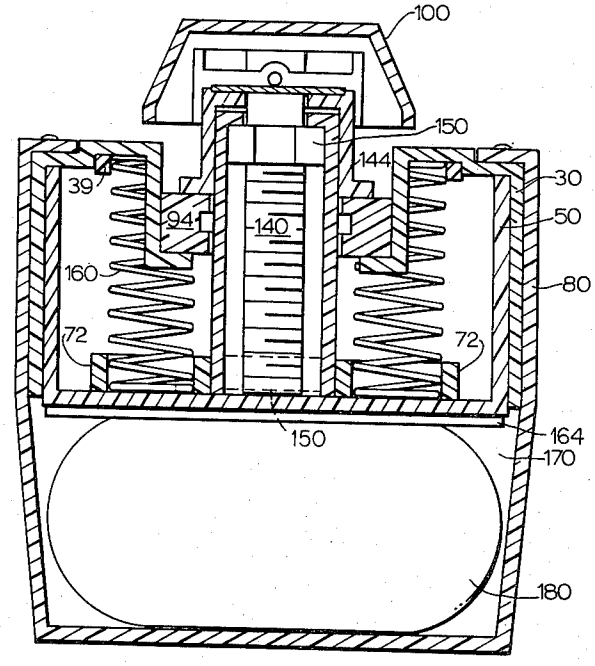
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Attorney, Agent, or Firm—Robert A. Green

[57] **ABSTRACT**

Fluid-dispensing apparatus comprises a housing including a movable plate-like piston and a unitary operating mechanism therefor including a shaft disposed within the housing and secured to the piston for (1) retracting the piston to permit a fluid-filled bag to be inserted in a chamber thus formed in the housing and (2) releasing the piston to apply pressure to the bag and to feed fluid therefrom. Only a handle for operating the apparatus is disposed outside of the housing and that is recessed to minimize the size of the apparatus. A plate, of selected thickness, is removably inserted in the chamber in the housing in contact with the fluid-filled bag to permit the pressure of the piston to be adjusted to the volume of the bag. This plate is also usable as a heater for heating the fluid in the bag.

4 Claims, 6 Drawing Figures



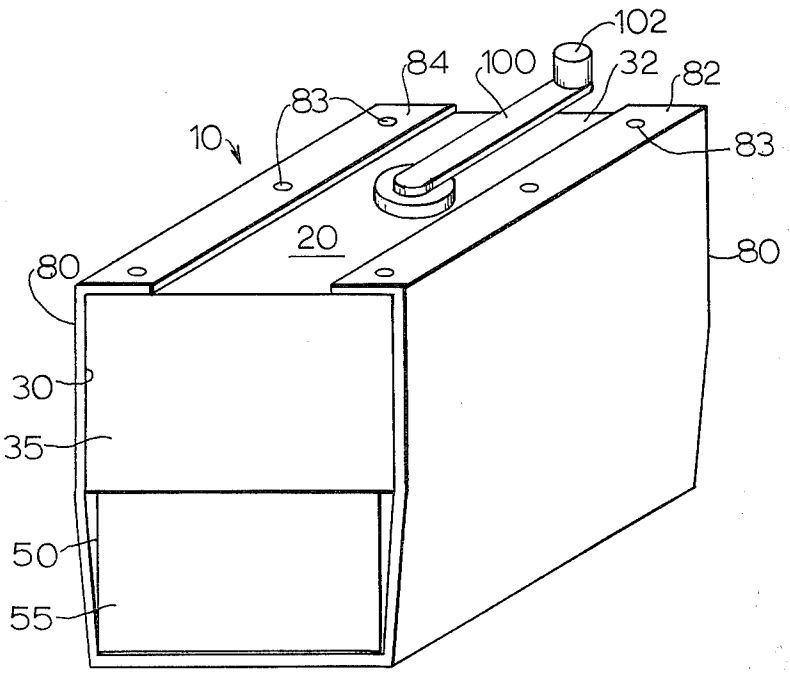

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Fig. 1

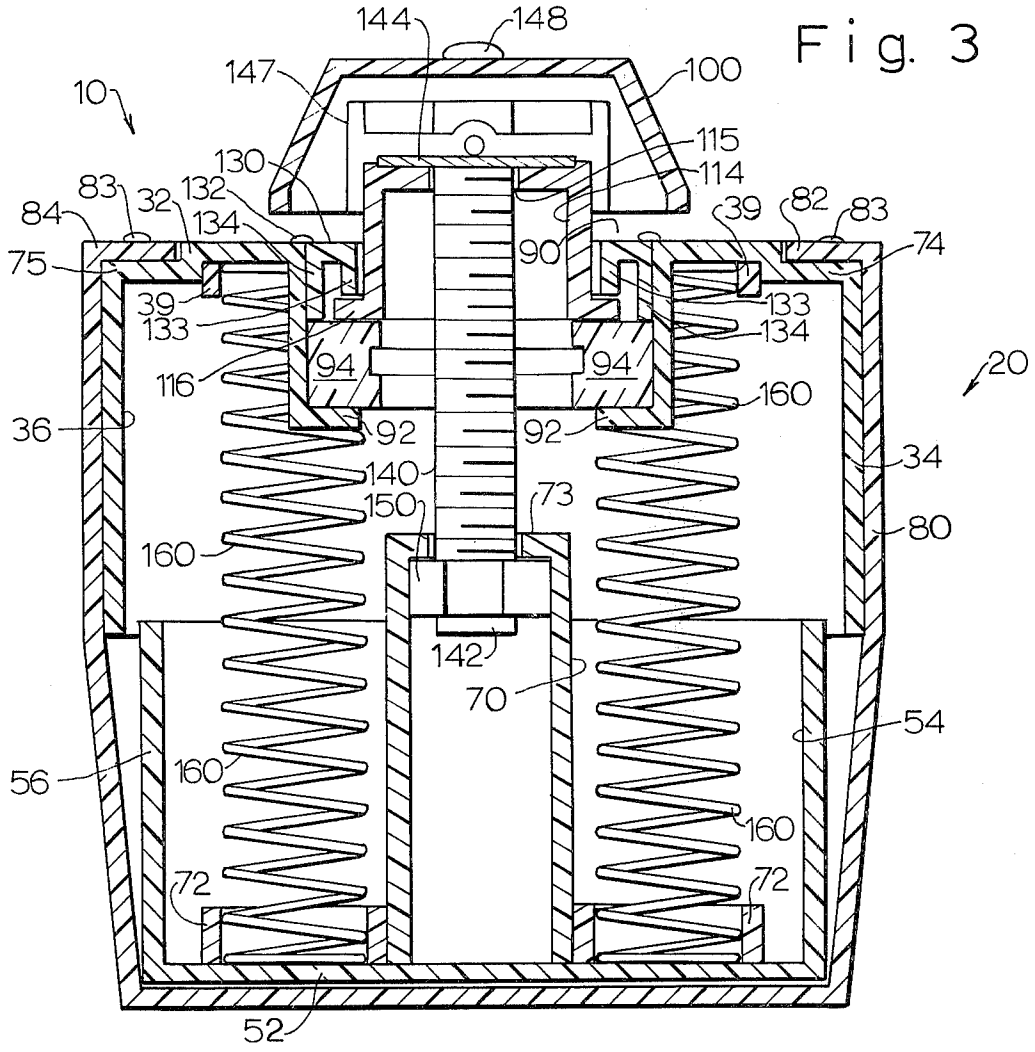

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Fig. 3

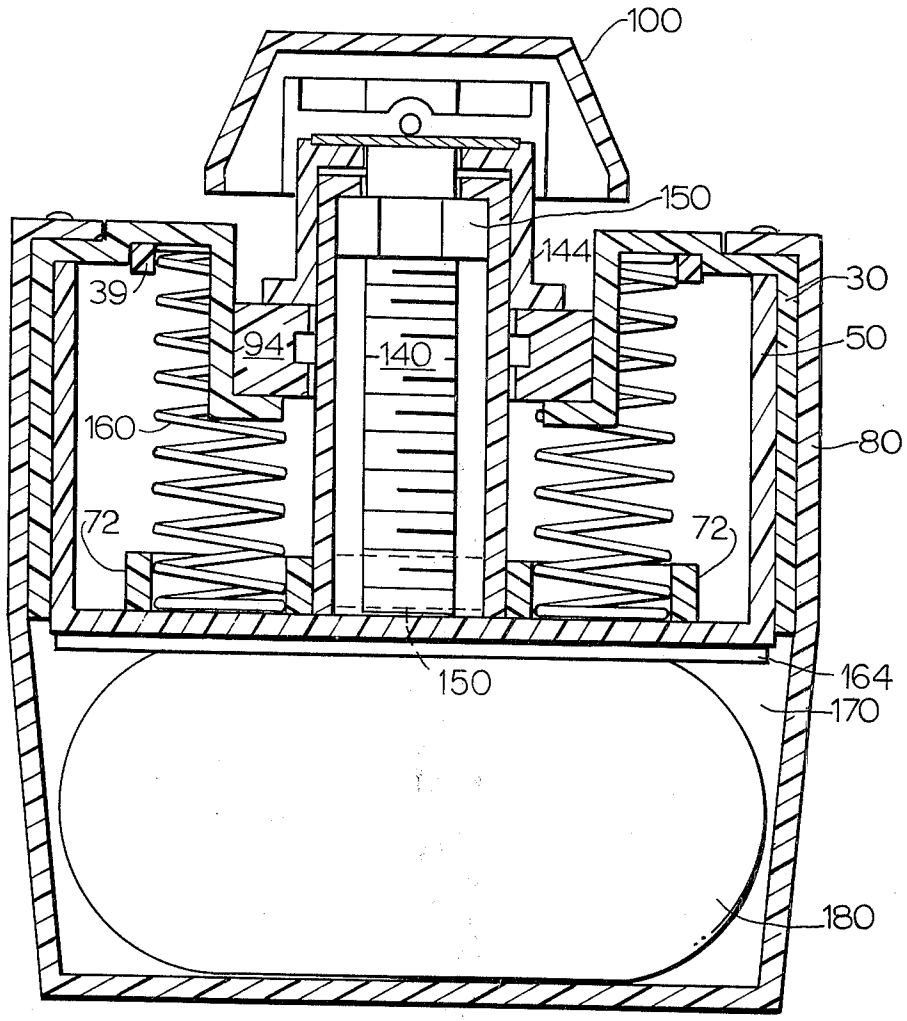


Fig. 6

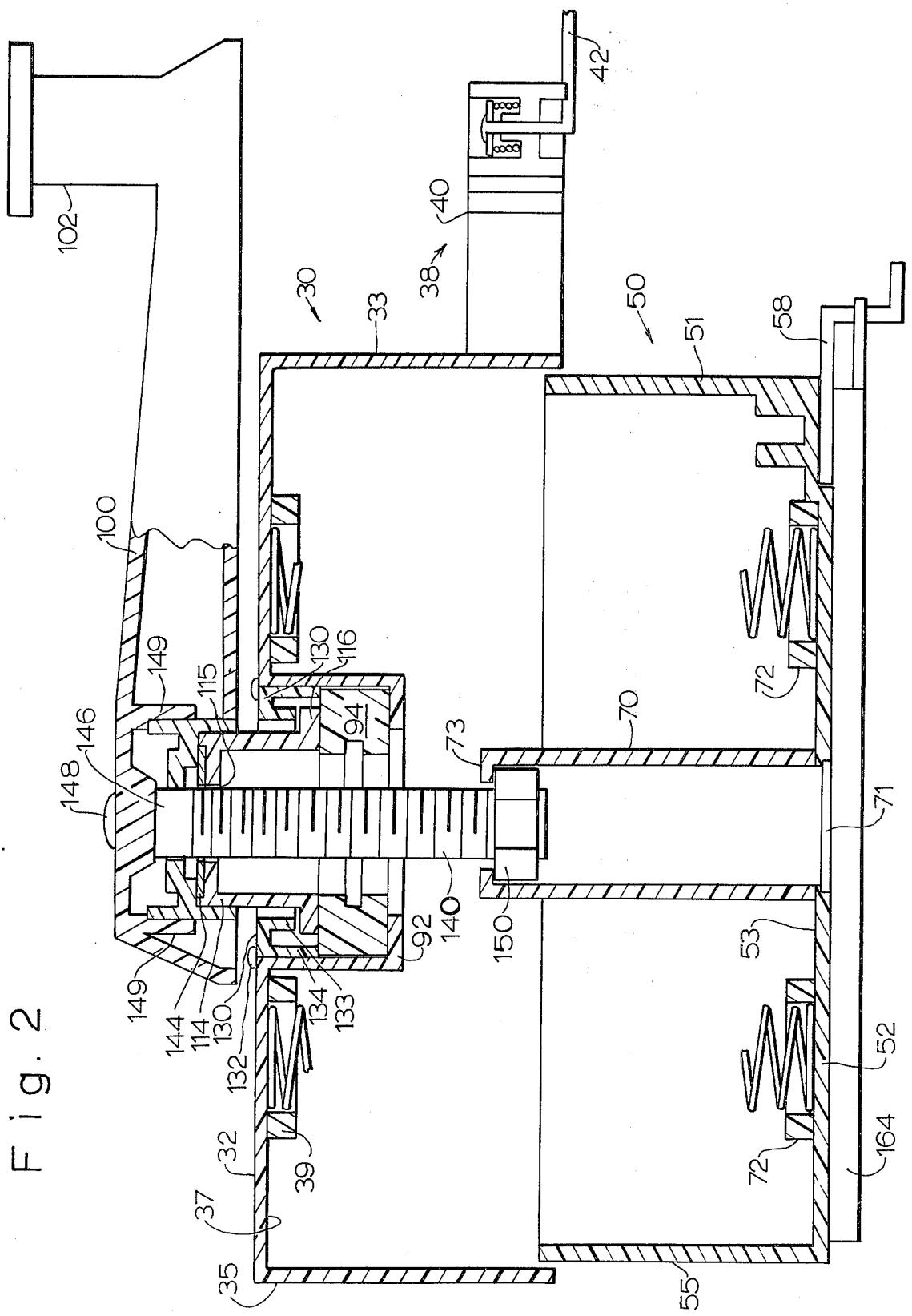
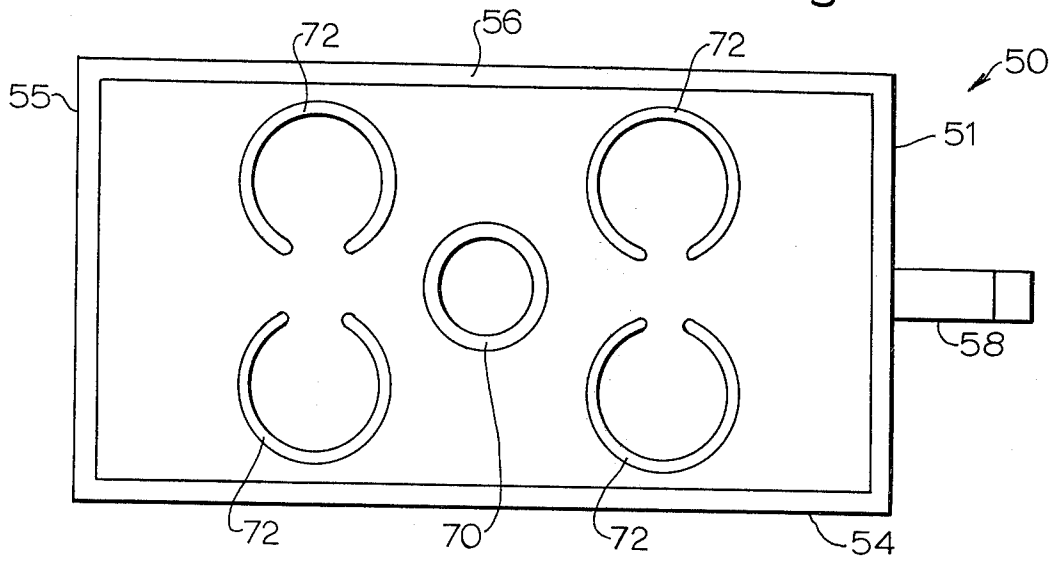

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Fig. 2

Fig. 4


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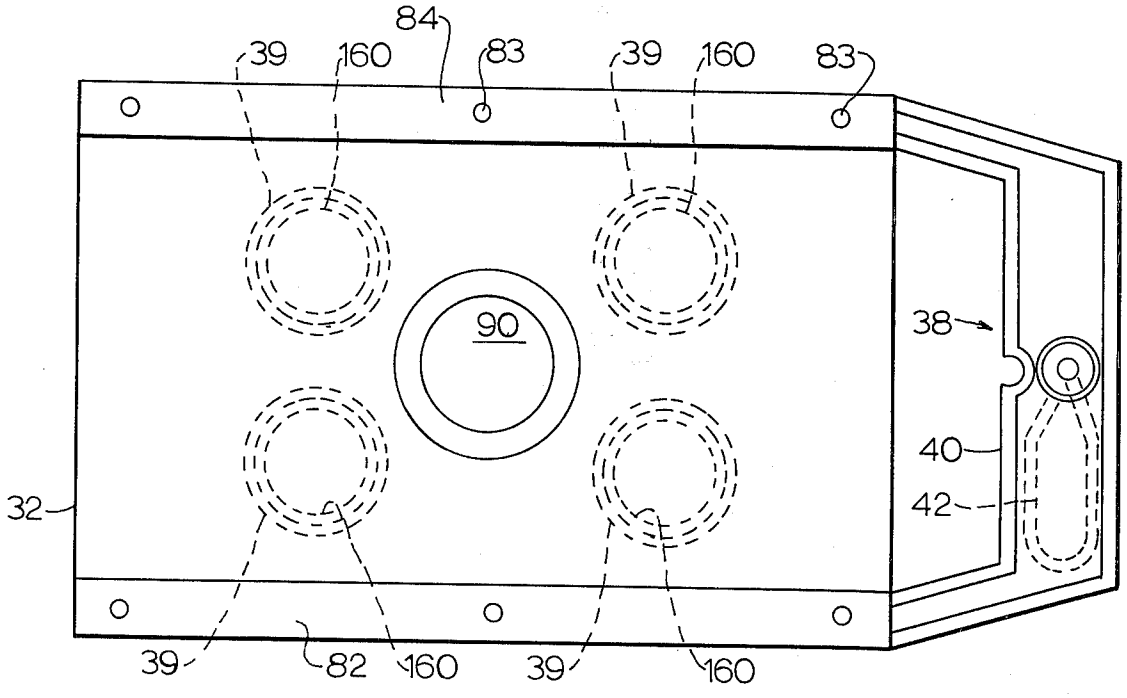

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Fig. 5

FLUID DISPENSING APPARATUS

This application is a continuation-in-part of application Ser. No. 338,295 filed Mar. 5, 1973, now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to fluid-dispensing apparatus and particularly to apparatus for feeding blood from a blood bag. Apparatus for feeding blood is known; however, such apparatus has drawbacks which are solved, generally, by U.S. Pat. No. 3,565,292. The present invention provides improvements over the apparatus described in said patent.

SUMMARY OF THE INVENTION

Briefly, apparatus embodying the invention comprises a housing including a piston for applying pressure to a fluid-filled bag and a unitary mechanism for setting the piston to an operating position and releasing it to force fluid from the bag, with substantially all of the operating mechanism disposed within the housing to provide a compact, efficient structure.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of apparatus embodying the invention;

FIG. 2 is a sectional, elevational view generally along the long axis of the apparatus of FIG. 1;

FIG. 3 is a sectional, elevational view generally along the short axis of the apparatus of FIG. 1;

FIG. 4 is a plan view of the lower portion of the apparatus of FIG. 1;

FIG. 5 is a plan view of the top of the apparatus of FIG. 1; and

FIG. 6 is a sectional, elevational view similar to that of FIG. 3 showing the apparatus set to receive a fluid-filled bag.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Apparatus embodying the invention is useful for dispensing any type of fluid from a deformable container, but it is especially useful for dispensing blood from a blood bag, and the apparatus is so described herein.

Blood-dispensing apparatus 10 comprises a housing 20 which includes a first box member 30, which has a top wall 32, end walls 33 and 35, a front wall 34, and a rear wall 36, but no bottom wall. The inner surface 37 of the top wall 32 is provided with a plurality of generally circular ribs 39 to act as retainers and positioners for springs to be described. The front wall 34 is provided with a handle or hanger 38 which consists of a frame 40 secured to the outer surface of wall 34 and having a handle 42 pivotably secured thereto.

The housing 20 also includes a second box member 50, generally of the same shape as box member 30 but somewhat smaller so that it can slide into box 30. The inner surface 53 of the bottom wall 52 of the second box 50 is provided with an open-ended tube 70 at about its center and extending vertically therefrom. The tube 70 has a non-circular cross-section, preferably hexagonal. The upper end of tube 70 is provided with an inwardly formed annular lip 73, and, at its lower end, it is closed by a removable cap 71 which permits access to the interior of the tube 70. The top surface 53 of wall 52 also carries a plurality of generally circular ribs 72 for use as spring guides. A rigid hanger 58 is secured to

the bottom wall 52 of box 50 at about the center thereof and at about the center of the end wall 51, and it projects outwardly from this point of attachment.

Finally, the housing includes a strap-like, wrap-around closure member 80 which encloses said first and second box members 30 and 50, overlaying the front and rear walls thereof. The strap 80 has one end 82 secured by screws 83, or the like, to a marginal portion 74 of the top wall 32 of box 30 where the wall 32 joins front wall 34. The opposite end 84 of the strap 80 is similarly secured to the opposite edge 75 of the top wall 32. The strap 80 does not cover the end walls of the members 30 and 50.

The first and second box members 30 and 50 and strap 80 may be made of metal, plastic, or any other suitable material, as desired.

The top wall 32 of the first member 30 is shaped to provide a cylindrical depression 90 at about its center and aligned with the tube 70 which is secured to the inner surface of the bottom wall 52 of member 50. At the lower end of the depression 90, wall 32 is provided with an annular lip 92 on which is seated an annular bearing 94.

The housing 20 is provided with a handle 100 which has a swivel knob 102. The handle assembly includes the following. An annular sleeve or hub 114 is seated on bearing 94 by means of an annular foot 116 formed at its lower end. The hub 114 is held in place by a generally U-shaped annular member 130 which is secured to the top wall 32 by screws 132 or the like and includes one arm 133 which is positioned close to the foot 116 of hub 114 and a second annular arm 134 which is seated on bearing 94 and holds the bearing securely in place.

A threaded shaft 140 is inserted in the opening 115 in hub 114 and extends vertically downwardly, with its lower end 142 disposed within tube 70. A hexagonal nut 150, matching the cross-section of tube 70, is secured to the lower end 142 of shaft 140 inside tube 70. Removable tube cap 71 permits access to nut 150 and the end of the shaft 140. The shaft 140 carries an annular ring or disk 144 which is seated on the top surface of hub 114 or in a depression therein. An annular sleeve 147 is seated on the disk 144 and hub 114, and the handle 100 is secured to the upper end 146 of shaft 140 by a screw 148. The handle 100 carries ribs 149 which engage sleeve 147 and thus clamp down the entire handle and shaft assembly.

A plurality of coil springs 160, preferably four, are disposed within the housing 20 between the top wall 32 of the first box member 30 and the bottom wall 52 of the second box member 50 where they are held in place by circular ribs 39 and 72. The springs are disposed generally as illustrated in FIGS. 4 and 5.

If desired, means for heating a blood bag is provided in housing 20, and, in one form, the heater comprises a metal plate 164 carrying heating wires (not shown) which are adapted to be connected to house current. The heater plate 164 (shown only in FIG. 2) is disposed adjacent to the outer surface of lower wall 52 of box member 50 and is hooked onto hanger 58. The heater may also comprise a plastic plate having the heater wires embedded therein.

In operation of the invention, initially the apparatus appears as in FIGS. 1 and 3, with the wall 52 of the second member 50 in contact with the outer casing member 80. To operate, the handle 100 is rotated to turn

the shaft **140** and to cause the nut **150** to move upwardly along the shaft. Since the nut engages the lip **73** of the tube **70,** it pulls the lower member **50** with it (FIG. **6**) and thus forms a space **170** between the bottom wall **52** of the second member **50** and the strap **80.** As the handle is turned and when the desired spacing is achieved, the worm drive action of the shaft **140** and the pressure of sleeve **114** on bearing **94** hold the handle in place and prevent involuntary rotation of the shaft and movement of box member **50.** As the lower member **50** is raised, springs **160** are compressed and tube **170** enters the annular hub **114,** as illustrated in FIG. **6.** When the lower box member **50** is raised sufficiently, a blood bag **180** is inserted in space **170** and wall **52** can bear against the bag. If heater **164** is present, it, too, bears against the blood bag and heats the blood.

Now, the handle **100** is rotated in the reverse direction to drive the nut **150** downwardly from its position of contact with the lip **73** to the position shown in dash lines in FIG. **6,** and this permits the compressed springs **160** to cause the lower box member **50** to move downwardly against the blood bag and simultaneously to force blood therefrom through the usual outlet feed tube (not shown).

The apparatus is now ready for insertion of a second blood bag and a repeat of the foregoing cycle of operation.

It is noted that heater plate **164** is removably insertable in housing **20,** and, in addition to serving to heat a blood bag, it also can serve to reduce the volume of the chamber **170** and thus to increase the pressure applied to a blood bag. This is particularly useful and desirable in the case of blood bags of the type which contain packed cells, as opposed to blood bags containing whole blood. Packed cells are more dense than whole blood, and bags of packed cells have a smaller volume than bags containing whole blood; thus, the additional pressure is needed to properly dispense packed cells. It is also noted that heater plates of different thicknesses can be used to achieve different pressure conditions. In addition, the plates used need not be heaters as such, but they may simply be plates of metal, plastic, or the like.

What is claimed is:

1. Fluid-dispensing apparatus comprising

a housing including

a first U-shaped box-like member having a top wall and side walls extending downwardly therefrom,

a generally tubular member extending downwardly from said top wall of said first box-like member and having an apertured bottom wall spaced from and disposed beneath said top wall of said first box-like member,

a cylindrical hub having an annular base portion suported on said bottom wall of said generally tubular member and a side wall which extends vertically therefrom and terminates in a top wall which is spaced above said top wall of said first U-shaped box-like member,

a second U-shaped box-like member having a bottom wall and side walls extending upwardly therefrom, said second box-like member beind slidable into and out of said first box-like member,

a frame enclosing said first and second box-like members and having an aperture for receiving a fluid-filled bag,

said second box-like member normally being positioned with its bottom wall closely adjacent to said frame in a first set position,

spring means in said housing urging said second supported member to remain in said first set position,

a hollow tube secured to the inner surface of said bottom wall of said second box-like member and extending vertically toward said top wall of said first box-like member, said hollow tube being generally axially aligned with said tubular member and with the aperture in the bottom wall thereof and aligned with said cylindrical hub whereby said hollow tube can enter said tubular member and said cylindrical hub,

a threaded shaft disposed vertically and extending through said cylindrical hub and through said aperture in the bottom wall of said generally tubular member and in axial alignment therewith, said shaft having an upper end and a lower end,

an operating handle secured to said upper end of said threaded shaft outside said housing and disposed adjacent to said top wall of said first box-like member, and

a nut secured to said lower end of said shaft and engaging the upper end of said tube when said second box member is in said first set position, said nut being held against rotation by said tube, said shaft and said tube thus being coupled together with said shaft being rotatable with respect to said nut, rotation of said shaft in one direction causing said nut to move upwardly along the shaft and drawing said tube and said second box-like member with it, with said tube entering the aperture in the bottom wall of said generally tubular member and entering said cylindrical hub, and said second box-like member entering said first box-like member and forming a space between the bottom wall of said second box-like member and said frame, said space being aligned with said aperture in said frame and serving to receive a fluid-filled bag, said second box-like member thus being held in a second set position within said first box-like member, rotation of said shaft in the opposite direction causing said nut to move downwardly along said shaft and thus to become disengaged from the upper end of said tube whereby, under the urging of said spring means, said tube and said second box-like member can move downwardly out of said first box-like member and toward said frame whereby said second box-like member applies pressure to said fluid-filled bag and causes fluid to be dispensed therefrom.

2. The apparatus defined in claim **1** and including a plate-like member removably positioned in said space between the bottom wall of said second box-like member and said frame whereby the volume of said space is reduced and the pressure on a fluid-filled bag positioned in said space is increased.

3. The apparatus defined in claim **2** wherein said plate-like member is a heater for heating fluid in said fluid-filled bag.

4. The apparatus defined in claim **2** wherein said spring means comprises a plurality of springs disposed between said first wall and said second wall and urging said first and second walls apart.

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