

[54] **LIQUID APPLICATOR DEVICE**

[76] Inventors: **Siegfried Knupfer**, Bernhauser
Strasse 21, 7303 Neuhausen;
Hermann Brinkmann,
Gottl.-Daimler-Strasse 50,
Neuhausen, both of Germany

[22] Filed: **Apr. 16, 1971**

[21] Appl. No.: **134,767**

[52] U.S. Cl. **401/9, 118/215**

[51] Int. Cl. **B05c 7/06**

[58] Field of Search 401/9; 118/214, 215,
118/254, 205, 506; 117/9 J; 101/41; 138/97

[56] **References Cited**

UNITED STATES PATENTS

2,810,145	10/1957	Forrow	401/9
3,607,361	9/1971	Hight	117/95
3,269,421	8/1966	Telford	138/97
3,335,700	8/1967	Di Grado et al.	118/215
3,301,736	1/1967	Smith	118/506

3,111,796 11/1963 Meissnor..... 118/506 X

FOREIGN PATENTS OR APPLICATIONS

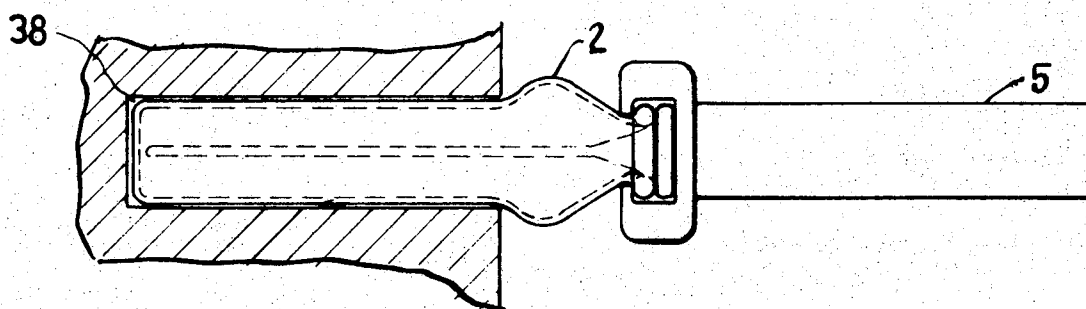
18,712 3/1928 Netherlands..... 101/41

Primary Examiner—Lawrence Charles
Attorney—John J. McGlew and Alfred E. Page

[57] **ABSTRACT**

A device for the application of liquids, particularly high viscosity substances, such as glue and the like, comprises a lay-on member which is inflatable and which is connected to a filling and discharge line for causing the inflation. The device may be used to fill cracks or grooves by placing the lay-on member in the groove or crack and then inflating it. The lay-on member may also include an inner core within the envelope defining a space between the lay-on member and the core for containing the medium to be applied and which will issue from the pores of the member after the lay-on member is inflated.

14 Claims, 19 Drawing Figures



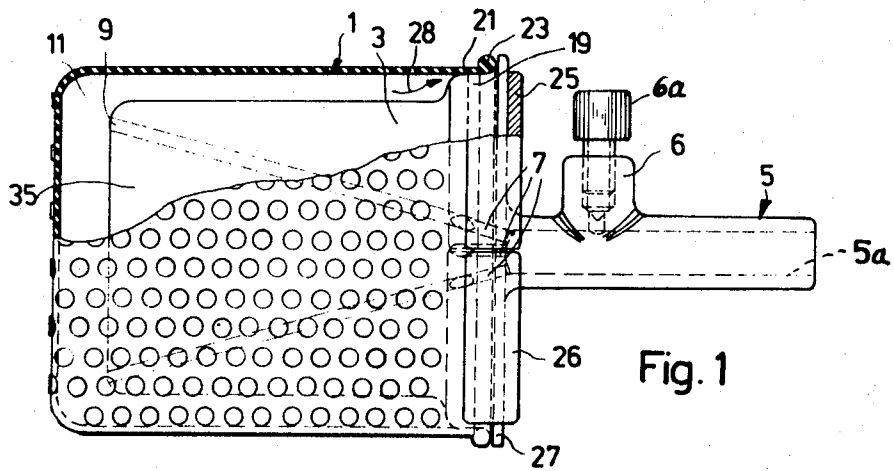


Fig. 1

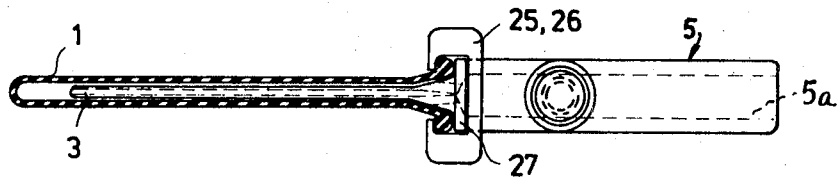


Fig. 2

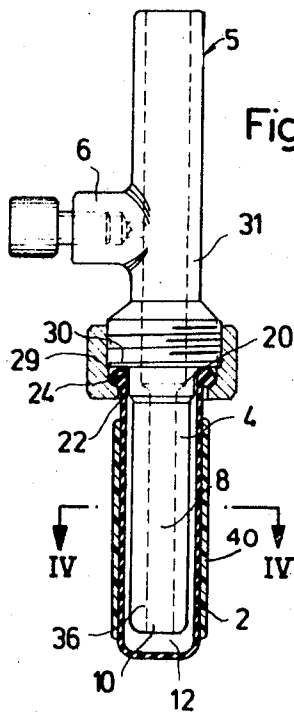


Fig. 3

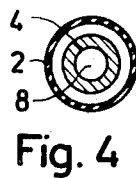


Fig. 4

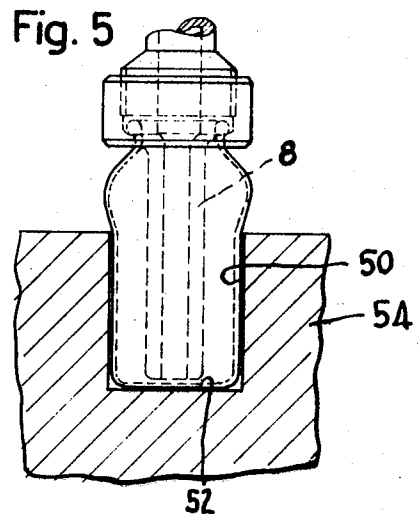


Fig. 5

INVENTORS
SIEGFRIED KNÜPFER
HERMANN BRINKMANN
BY

McGraw & Tuttle
ATTORNEYS

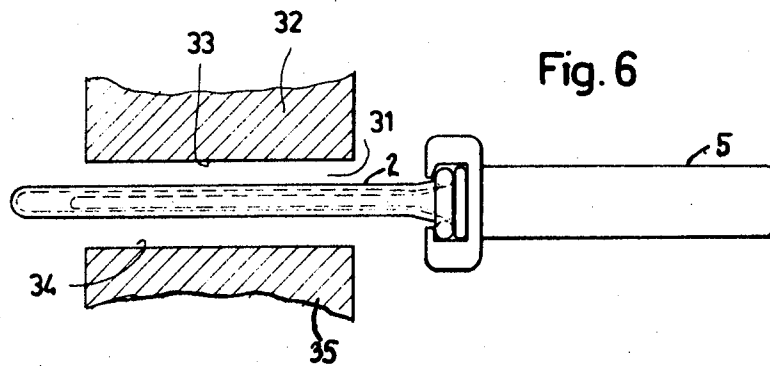


Fig. 6

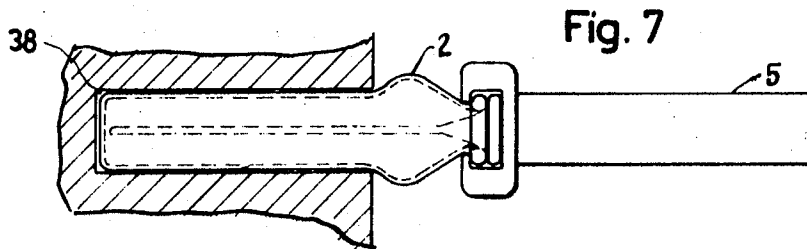


Fig. 7

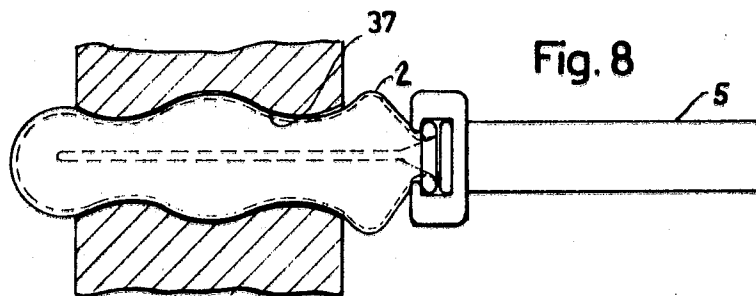
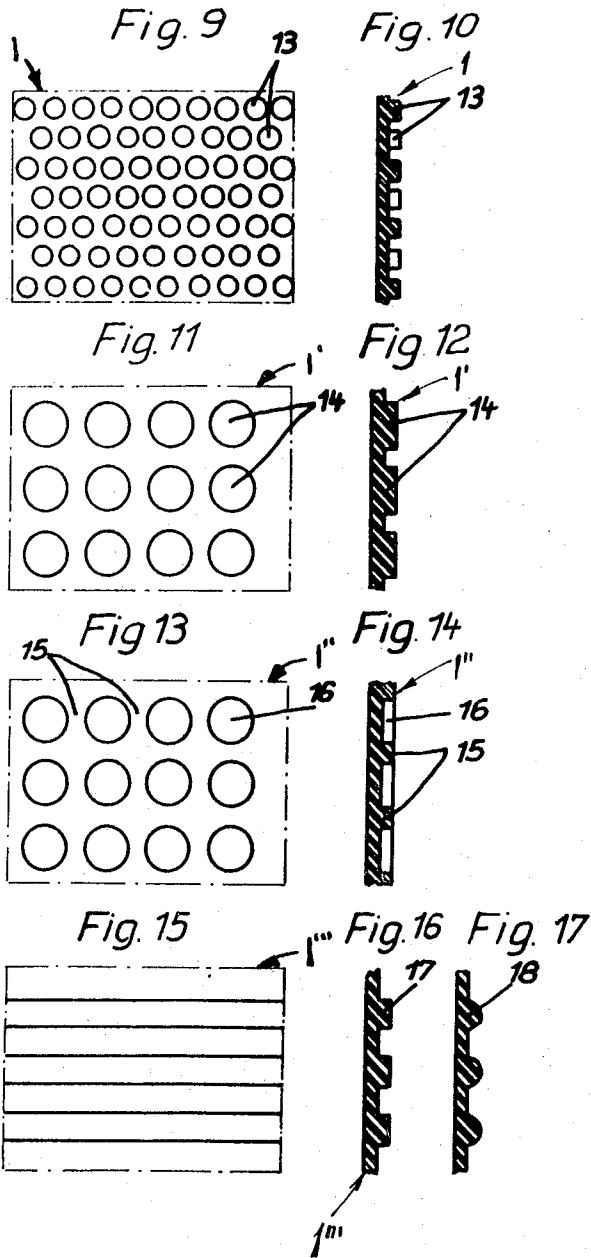


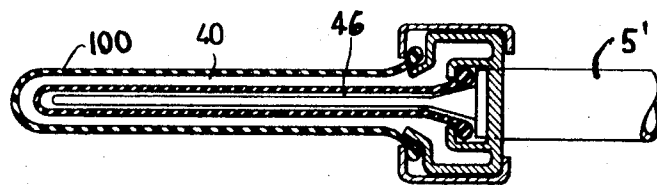
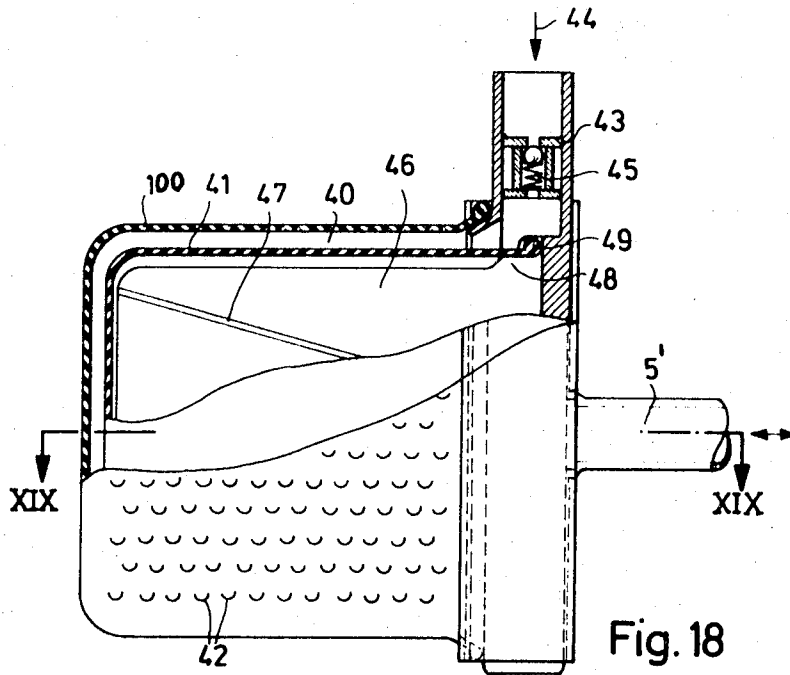
Fig. 8

INVENTORS
SIEGFRIED KNÜPFER
BY HERMANN BRINKMANN

McGraw & Tuttle
ATTORNEYS



INVENTORS
SIEGFRIED KNÜPFER
HERMANN BRINKMANN
BY
McGraw & Tuttle
ATTORNEYS



INVENTORS
SIEGFRIED KNÜPFER
BY HERMANN BRINKMANN

McGraw & Tuttle
ATTORNEYS

LIQUID APPLICATOR DEVICE

SUMMARY OF THE INVENTION

This invention relates in general to the construction of liquid applicators and in particular to a new and useful applicator particularly for very viscous substances such as glue which includes an inflatable lay-on member mounted on a connection for the inflation medium and/or the medium to be applied.

The invention relates particularly to a device for the application of liquids, in particular high viscosity substances, such as glue and the like on workpiece area, preferably grooves, slots, bores and the like. In the known devices serving for the wetting of workpiece surfaces it is regarded as a disadvantage that they are often not very useful or not usable at all for applying the substance in question to inaccessible areas, especially at recessed locations. In the case of blind bores, for example, it is often not possible to spread glue, paint or the like on the entire inner surface. This results in the reduced holding force of a part to be secured by glueing or an imperfect surface protection. In many cases, while the entire area in an inaccessible location is provided with the substance to be applied, much of the applied substance is carried away again as the wetting device is removed, since during introduction as well as extraction from the gap or bore to be wetted, the applicator remains in constant contact with the surfaces thereof.

The present invention avoids the disadvantages of the known designs. In particular the applicator is to be suitable for wetting or painting poorly accessible areas, in particular bores, grooves and the like. Moreover, it is formed so that in spite of movements back and forth or in and out on one and the same path, that is, for example, when used in connection with a machine, it does not strip off the substance applied in one direction of movement during movement in the opposite direction.

The invention is characterized by an elastic, pneumatically or hydraulically inflatable lay-on member connected with a filling and discharge line. This device is wetted on its outside in the usual manner, for example, by immersion into a vessel containing the substance to be applied, then it is introduced, in the slack state, into a slot, gap or bore, then put under pressure and brought in contact with the surface to be wetted. It then transfers a part of the substance adhering to it. The device can then be pulled out of the slot or bore either in the slackened or inflated state as needed. A partial movement in the inflated state and the remaining movement in a slackened state may be desired in some cases. When wetting or painting external free (exposed) areas by means of an applicator which is moved past the area, the return movement with the device slackened can take place on exactly the same path without danger of wiping the substance away again. The device according to the invention is therefore suitable not only for so-called different areas, but for any normal area as well.

In a preferred form of embodiment of the invention, the filling and discharge line is connected with a rigid core portion, penetrating into the lay-on member, sealingly connected with the latter, and provided at least at its penetrating portion with at least one flow channel for the hydraulic or pneumatic medium entering at the surface thereof and connected to the filling and discharge line. Said core portion prolongs in a way, by

means of its flow channel or channels, the filling and discharge line into the lay-on member. Moreover, in particular when the lay-on member is slightly inflated, it can serve as a supporting area for the transversely applied lay-on member. It is further particularly advantageous that at least one channel leads out at the end of the core portion penetrating farthest into the lay-on member. It is thus insured that, when the cavity formed by the lay-on member as the lay-on member is being sucked empty, the lower lying part of the filling space also can be sucked empty despite the resting of the lay-on member against the portions of the interior core. As the device is being evacuated, the lay-on member places itself before the mouth openings of the core portion, thereby sealing them; so that further suctioning off of the pressure medium is no longer possible. For this reason provision must be made that in any desired position of the device at least one internal mouth opening remains free until the filling space has been completely evacuated. It is therefore expedient to provide such outlet bores at several points of the core portion, which either all open into a channel or communicate with the filling and discharge line over different channels. In particular, the arrangement of such mouth openings at the upper and lower end of the core portion is important. Mouth openings may also be located in the center of the core portion.

The core portion is preferably designed as a sword or bag like member or it may be designed as a pin, cylinder, cone or the like. The form to be selected depends on the purpose and type of areas for which the device is to be preferably used. In further development of the invention, the lay-on member is designed in the form of a pot or pocket and is provided at its outlet edge with a circling bead acting as annular seal. The cross-section form of the lay-on member will advantageously be adapted to the core portion, but it is not absolutely necessary to take the same cross-section form for both parts.

A simplification and reduction of cost of the device can be achieved in further development of the invention in that the filling line is designed at the same time as a discharge line, also the aeration valve can still serve its basic function. As the pressures are relatively low, a simple valve screw is sufficient here, which may be equipped with a knurled head for manual operation or it may be hexagonal or the like for operation with a tool.

According to a further feature of the invention, the lay-on member is made of rubber or similar highly elastic material, in particular plastic. On its outer face there are warts, nubs or the like. These serve, on the one hand, to enlarge the surface and, on the other, to form depressions by means of which greater wetting of the lay-on member is possible. In another very appropriate form of construction the lay-on member is provided at its outer face with raised, parallel and/or crossing webs. The purpose of this design is in principle the same as in the aforementioned embodiment.

According to another feature of the invention, the device comprises a handle carrying the filling and/or discharge line as well as the aeration and deaeration valve, which handle is provided furthermore with a pneumatic filling and evacuating pump. The shank of the handle may be used, for example, as cylinder for a piston pump which may be designed as a pressure and/or vacuum pump.

Another feature of the invention is characterized in that the outer face of the lay-on member is covered, at least partially, with absorbent foam material. The latter is of advantage, in particular, when the utensil is used in connection with a substance of lower viscosity. A sponge type foam material, in fact, can retain more liquid than for example a merely roughened surface.

For reasons of safety it is very expedient also that the cavity formed by the core portion and the inner face of the lay-on member is connectable by means of a relief valve with the outer air, so that harmful excess pressure can be kept away from the lay-on member. For this purpose, an annular packing bead on the lay-on member is sealingly retained, not at its entire circumference, but only at the greater part thereof. While the remaining retained packing part also rests sealingly against a counterface, it is not pressed against it. As soon as the pressure in the interior reaches a certain maximum value, it lifts this packing off the contiguous face and permits issuance of the pressure medium for the duration of the overpressure. It is clear that such relief valves are suitable primarily for compressed air-fed devices.

Accordingly, it is an object of the invention to provide an improved device for applying a viscous liquid such as glue and which includes an elastic inflatable lay-on member and a fitting connected to the lay-on member and inflating and discharging the lay-on member.

A further object of the invention is to provide an applicator particularly for glue which includes at least one elastic bag like member and a handle part forming an inlet and outlet for the inflatable medium and which advantageously also includes an inlet for the medium to be applied, and wherein the lay-on applicator comprises either one or two bag elements and with the space between the bag elements filled with the medium to be applied and the inner space inflated to apply pressure to force the medium to be applied through the pores of the outer bag like element.

A further object of the invention is to provide a method of applying a material such as glue to an inaccessible area such as a groove or recess comprising positioning a bag like applicator into the groove or recess in a relaxed condition, inflating the applicator to cause it to move into association with the walls bounding the groove or recess to apply the medium to be applied by pressure contact, thereafter deflating the applicator at least partially to remove it from the surface of the walls bounding the groove and removing it from the groove.

A further object of the invention is to provide a device for applying a viscous liquid such as glue and the like which is simple in design, rugged in construction and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its uses, reference should be had to the accompanying drawing and descriptive matter in which there is illustrated preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a side elevational view partly broken away of a glue applicator constructed in accordance with the invention;

FIG. 2 is a partial top plan and partial horizontal sectional view of the applicator shown in FIG. 1;

FIG. 3 is a partial side elevational and partial sectional view of another embodiment of the applicator;

FIG. 4 is a section taken on the line IV—IV of FIG. 3;

FIG. 5 is a section through a groove with the applicator positioned in the groove and in operating position; FIGS. 6, 7 and 8 are views similar to FIG. 5 showing various positions of an applicator in respect to parts which require the application of a liquid thereto;

FIGS. 9, 11, 13 and 15 show partial side elevational views of an applicator bag; and

FIGS. 10, 12, 14, 16 and 17 show corresponding sectional views of applicators indicated in respective FIGS. 9, 11, 13 and 15;

FIG. 18 is a view similar to FIG. 1 of another embodiment of the invention; and

FIG. 19 is a section taken along the line XIX—XIX.

GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings in particular, the invention embodied therein in FIGS. 1 and 2 comprises an applicator device which includes a lay-on member or a bag applicator generally designated 1 having a core portion 3 which is located within the lay-on member 1 and is spaced inwardly from the interior walls thereof. The lay-on member 1 is mounted on a combination inflation medium inlet and discharge connection-and-handle or guide generally designated 5 having an opening 5a for the inlet or outlet of an inflation medium such, as air, and containing a deaeration valve 6 with a threadable adjustment valve portion 6a. The handle 5 may advantageously be engaged by an operator's hand and manipulated by an operator. An inflation fluid such as a liquid or gas may be delivered through the fitting 5 into channels 7 which are defined in core portion 3 and which terminate at their outer ends in openings 9 leading into an intermediate space between the outer lay-on member 1 and the inner core 3. When the inflation medium is directed into the space the cavity 11 is filled and the lay-on member 1, being formed of a highly elastic material such as rubber, will expand to enlarge its outer circumference and move it into contact with an area to receive an application of the viscous liquid. This viscous liquid may be coated on the exterior of the lay-on member 1 or applied by directing it outwardly through pores of the lay-on member such as in the embodiment of FIG. 18 which will be described hereinafter.

As indicated in FIGS. 9 through 17 the lay-on member 1 may have circular cylindrical nubs 13 arranged in a row as shown in FIGS. 9 and 10. In this construction, the nubs of the next following row are offset from the previous row. The nubs 14 of the showing of FIGS. 11 and 12 are made with a larger diameter and they are arranged in horizontal rows.

In the showing of FIGS. 13 and 14, the raised portions of the outer surface of the lay-on member 1 comprises crossing webs 15. These webs are formed by blind hold type depressions 16 arranged in vertical and horizontal rows.

In FIGS. 15, 16 and 17 two examples of construction are shown where the raised surface portions of the lay-

on member 1 are also formed by webs. In this arrangement, the webs do not cross but are all arranged parallel to each other. In the showing of FIG. 16 the webs are of rectangular cross-section and indicated by the numeral 17, while the webs 18 shown in FIG. 17 are semicircular in cross-section.

In the embodiment shown in FIGS. 3 through 5 the applicator device includes a lay-on member 2 having a core portion 4 and it includes the same type combination inlet connection and discharge connection 5 with an aeration valve 6. The interior core 4 includes a single channel 8 for the conveyance of the inflation medium such as a gas or a liquid which issues through an opening 10 into the space 12. The lay-on member 2 is also formed of highly elastic material such as rubber and therefore as soon as the pressure in the cavity 12 is sufficient, it is inflated by the gas or the liquid to enlarge its outer surface to permit it to engage for example with interior annular walls 50 or with a bottom wall 52 of a part 54 having a groove which is adapted to be coated with a substance of high viscosity such as glue, paint, lacquer or the like (FIG. 5). The material to be applied is first coated onto the layer member 2 by immersing the lay-on member into the substance.

As shown in FIG. 6, the applicator is positioned so that the lay-on member 2 is located between two workpieces 32 and 35. By the feeding of the pressure medium through the filling and discharge line 5 the lay-on member becomes inflated to cause it to deposit any material coated thereon onto the surfaces 33 or 34 when it is inflated. In FIG. 7, a complete cylindrical groove 38 is shown as being completely filled by an applicator, wherein the lay-on member 2 completely engages the entire surface of the blind hole 38. In FIG. 8, a curved surface 37 is shown being engaged by a lay-on member 2 which clearly indicates how the lay-on member will bend to the configuration to be covered and thus form a coating over the entire surface. During the inflation time, the substance on the lay-on member 2 is applied to the wall surface or transferred from the surface of the lay-on member to the surface to be coated. After this transfer, the pressure medium is discharged through the line 5 or through the deaeration valve 6. This causes the lay-on member 2 to shrink back to its original form and size so that the device can be moved out of the gap without effort and without again contacting any surface. In order to obtain complete deaeration or evacuation of the cavities 11 or 12 of the embodiments indicated in FIGS. 1 and 2 and 3, 4 and 5, respectively, the opening at the end of the inflow cavity must lie at an end which penetrates deeply into the lay-on member. If they are located at the center of the core portion or at the end located toward the packing edge 19 there is a danger that upon evacuation of a cavity these openings will be covered and block the channel before the part of the cavity located at the outer end of the core has been evacuated.

Both the core portions 3 and 4 of the two embodiments shown in FIGS. 1 through 5 comprise a material such as metal or plastic and they include a packing edge 19 for the core 3 and 20 for the core 4. The respective elastic lay-on members 1 and 2 are pulled over the free ends 21 and 22 of the respective cores 3 and 4. For this purpose, the lay-on members include encircling beads forming annular packings 23 and 24 respectively.

In the arrangement of FIGS. 1 and 2, the elastic bead 23 is retained by clamps 25 and 26 of C-shaped cross section standing in opposed relationship and which press against a flange 27. At the narrow side areas of the lay-on member 1, that is at the upper and lower edges shown in FIG. 1, the bead 23 is not pressed on. These two points form a certain overpressure safety device by means of which the pressure medium can issue in the direction of arrows 28 as soon as the pressure in cavity 11 assumes an impermissible value.

In the embodiment of FIGS. 3 through 5, the bead 24 of the pot type lay-on member 3 is pressed by means of the cap nut 29 against the collar 30. In order to secure this construction against overpressure a relief valve (not shown) is provided in the handle piece 31. It may comprise a spring loaded ball pressed against a seat and connecting the cavity 12 with the outside air.

The lay-on members may be of any configuration besides cylindrical, for example, they may be of spherical or conical form. The entire outer face of each lay-on member 1 or 2 or only a portion thereof as shown at 40 in FIG. 3 may be covered with an absorbent material such as foam plastic. This foam plastic material is of advantage especially when using the device in connection with a substance of lower viscosity. It also finds a better hold in the pores or grooves of the device to receive the liquid to be applied that would be the case when ribs or other projections are provided.

In the embodiment of the invention indicated in FIGS. 18 and 19 there is provided a lay-on member 100 having an elastic core 41 which are arranged together to define an inwardly sealed filling space 40 for the medium to be applied. The exterior of the lay-on member 100 is provided with a porous construction or includes a plurality of passage slots 42 evenly distributed over its surface. A viscous liquid such as glue, paint or similar substance is fed through the feed line 43 into the filling space 40 as indicated by the arrow 44. The check valve 45 prevents the flowing back of this medium when the device is used. In the plastic core portion 41 there is provided a relatively stiff sword shaped filling part 46. This part 46 is designed in the same manner as the core parts 3 or 4 of the other embodiment and it has channels 47 which are connected to the combined discharge and filling fitting 5'.

With the construction of the device as indicated in FIGS. 18 and 19, the lay-on member does not have to be immersed in the liquid to be applied first but the liquid is supplied through the line 43 to the space 40 and it issues out through the slots 42 after the lay-on member is inflated. The curved slots 42 act as flap valves and they block the outlet apertures if the filling space 40 is pressure-free or almost pressure-free. This is true in particular for highly viscous fluids which are to be applied. For thin substances therefore very small openings must be provided. Due to the natural elasticity of the material of the lay-on member 100, the slots 42 will close automatically when the pressure in the space 40 is reduced. In this embodiment when the core portion 41 is elastic, the sealing from the stiff filling portion 46 is taken over by a bead 48 of the filling portion 46 as well as by an annular bead 49 of the core portion 41 similar to the construction indicated in FIG. 1.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles of the invention, it will be un-

derstood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A device for the application of liquids, particularly highly viscous liquids such as glue and the like, on workpiece faces, comprising an inflatable elastic bag forming a lay-on member having a surface for containing and transferring the liquid to be applied and a fitting connected to said bag for filling and discharging an inflation medium into and out of said bag, a core member extending into said lay-on member and sealingly engaged at its periphery with said lay-on member, said fitting having a flow channel connection into said core into the space between said core and said lay-on member.

2. A device according to claim 1, wherein said lay-on member and said core are of pocket shaped configuration, said lay-on member extending into closely spaced relationship with the interior end of said lay-on member, said core having a passage extending therethrough for the inflation liquid terminating closely spaced to the interior of said lay-on member.

3. A device according to claim 2, wherein said core includes at least a portion which is rigid and forms a positioning sword.

4. A device according to claim 2, wherein said core includes a rigid portion forming a pin-like member for positioning the lay-on member.

5. A device for the application of liquids, particularly highly viscous liquids such as glue and the like, on workpiece faces, comprising an inflatable elastic bag forming a lay-on member having a surface for containing and transferring the liquid to be applied and a fitting connected to said bag for filling and discharging an inflation medium into and out of said bag, a core extending into said lay-on member and having exterior walls spaced slightly from said lay-on member interior walls, said fitting providing means engageable with said core and said lay-on member and sealing them peripherally, and relief valve means for relieving the space between said core and said lay-on member to relieve the inflation pressure therefrom if it exceeds a predetermined value.

6. A device according to claim 5 including means connecting into the space between the core in said lay-on member for filling said space with the material to be applied, said lay-on member having at least one core for the expulsion of the material to be applied therethrough.

7. A device according to claim 6 including valve means for closing the entrance to the space between said core and said lay-on member after filling.

8. A device according to claim 1 including a core member with at least a handle portion of substantially rigid form located within said lay-on member and holding said lay-on member in an extended position, said fitting including a connection extending through said core member into the space between said core member and said lay-on member to inflate said lay-on member and means for also supplying the material to be applied to the space between said core and said lay-on member, said lay-on member having a plurality of openings therethrough for the exit of the material under the pressure of the inflation medium delivered through said fitting.

9. A device for the application of liquids, particularly highly viscous liquids such as glue and the like, on workpiece faces, comprising an inflatable elastic bag forming a lay-on member having a coating surface for containing and transferring the liquid to be applied and a rigid support fitting connected to and adjacent said bag for filling and discharging an inflation medium into and out of said bag, said fitting comprising a tubular handle provided with an aeration and deaeration valve.

10. A device according to claim 9, wherein said lay-on member comprises a rubber material.

11. A device according to claim 9, wherein said lay-on member includes a plurality of projections on its surface.

12. A device according to claim 9, wherein said lay-on member includes a portion with an outer surface with raised parallel ribs.

13. A device according to claim 9, wherein at least a portion of the face of said lay-on member is covered with an absorbent foam plastic.

14. A device for the application of liquids, particularly highly viscous liquids such as glue and the like, on workpiece faces, comprising an inflatable elastic bag forming a lay-on member having a coating surface for containing and transferring the liquid to be applied and a rigid support fitting connected to and adjacent said bag for filling and discharging an inflation medium into and out of said bag, said lay-on member comprising a pocket shaped member having a mouth edge with an encircling bead, said fitting including a handle with a flange engaged with the encircling bead and forming a seal therewith.

* * * * *

50

55

60

65

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,748,049 Dated July 24, 1973

Inventor(s) SIEGFRIED KNUPPERS, ET. AL.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet, insert -- [30] Claims Foreign

Priority Data Germany P 20 18 163.9 4/16/70 -- .

Signed and sealed this 22nd day of January 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents