May 3, 1966 L. C. BARR ETAL 3,249,262

FLAME SPRAYING TORCH

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Fig. 1.

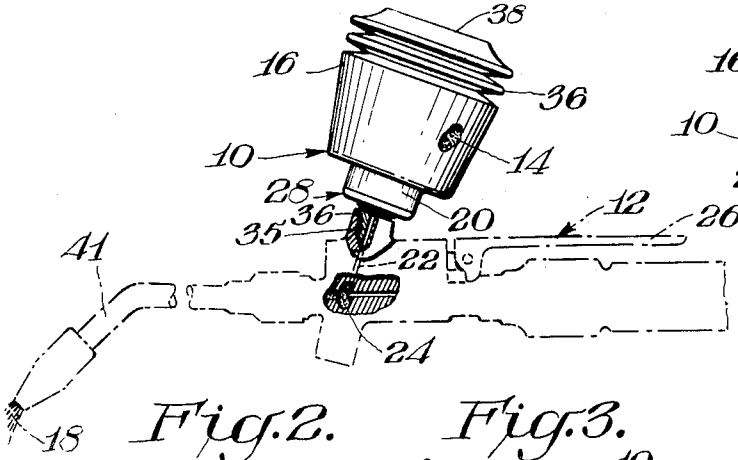

Fig. 7.

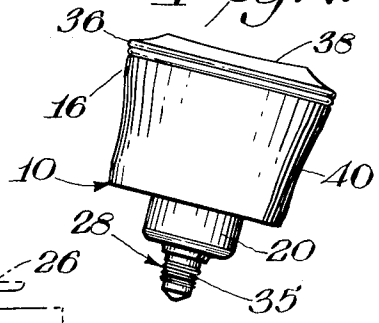

Fig. 2.

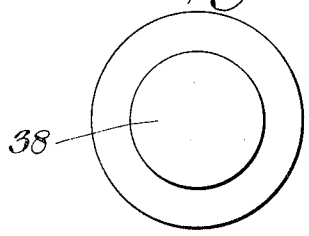

Fig. 3.

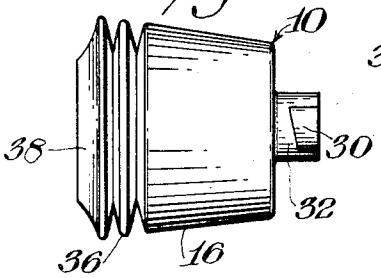

Fig. 4.

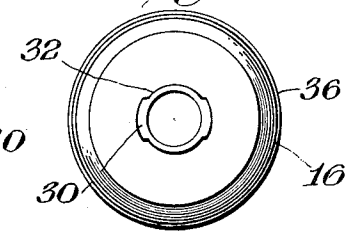

Fig. 5.

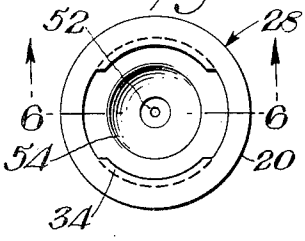

Fig. 10.

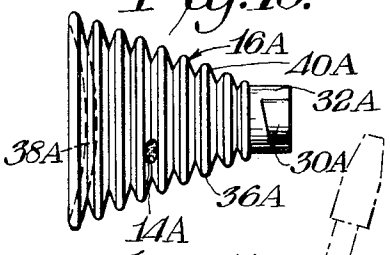

Fig. 8.

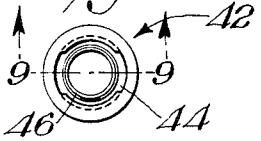

Fig. 9.

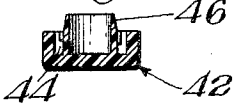

Fig. 6.

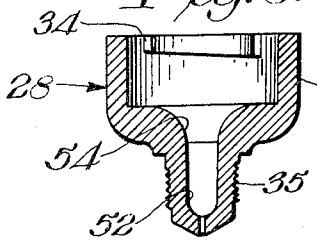

Fig. 11.

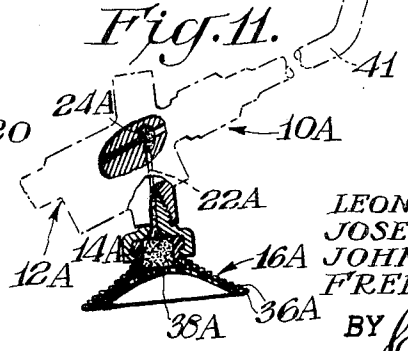

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Fig. 13.

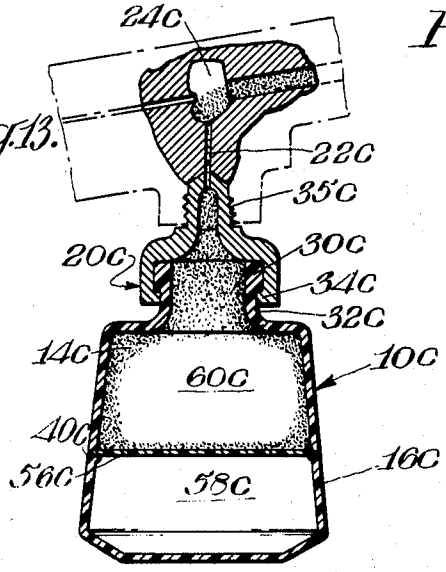

Fig. 12.

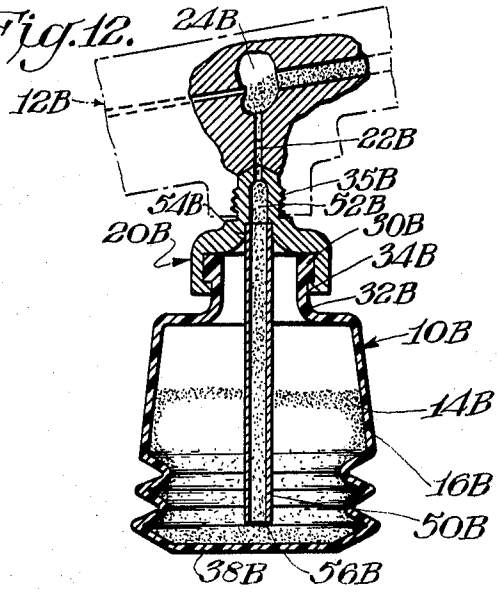

Fig. 14.

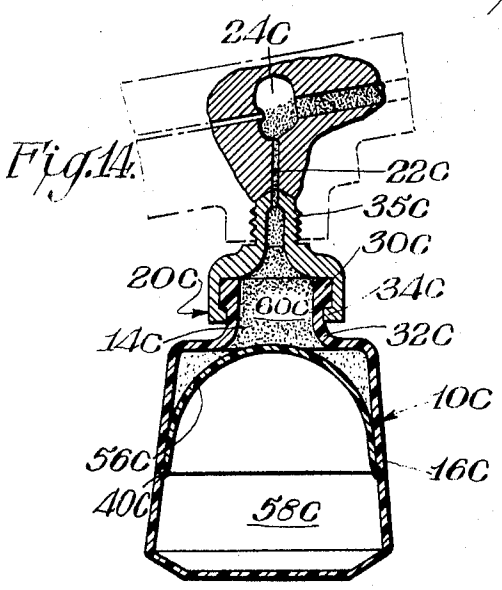

Fig. 15.

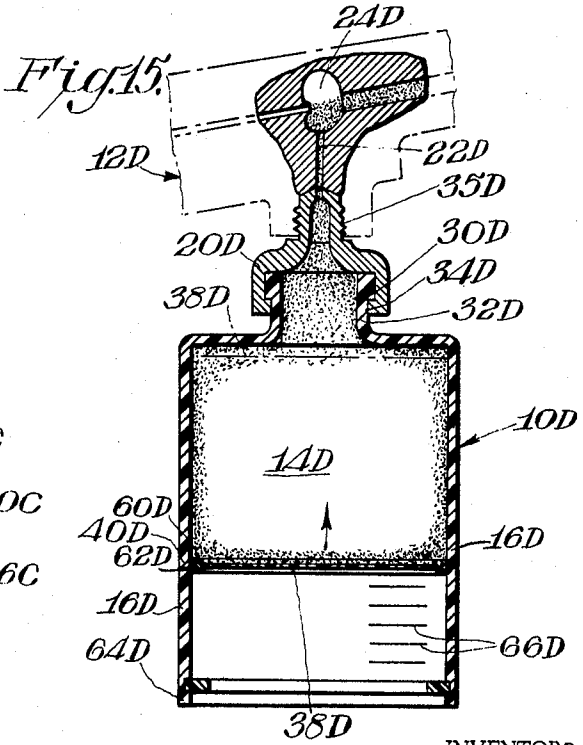

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Fig. 16.

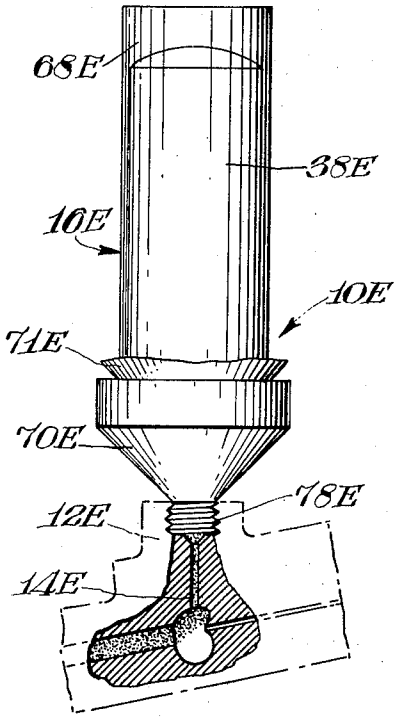


Fig. 17.

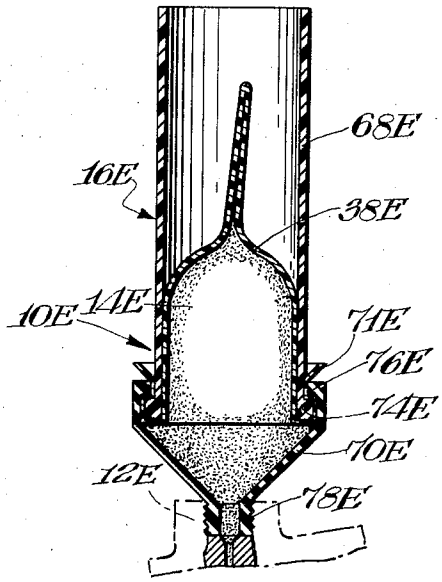
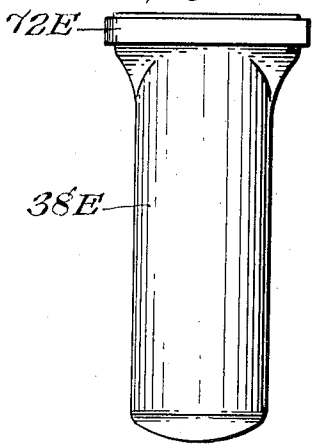


Fig. 18.



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3,249,262

FLAME SPRAYING TORCH

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Filed Dec. 5, 1963, Ser. No. 329,619
6 Claims. (Cl. 222—193)

This application is a continuation-in-part of prior copending application Ser. No. 314,763, filed October 8, 1963, now abandoned.

This invention relates to a powder feeding device for a flame spraying torch, and it more particularly relates to powder container aspects of such a device.

Powder containers for flame spraying torches which inject powder into the emitted stream of burning gas to fuse them upon a surface generally include an air opening into the container to prevent an internal reduction of pressure which might interfere with dispensing of the powder. Such apertures are usually disposed in the end of the container remote from its coupling to the torch, which end constitutes the bottom of the container when it is removed from the torch for storage. These holes must therefore be sealed when the containers are removed from the torch to prevent spillage. They are also likely to spill powder when the torch is being used in an orientation that disposes the container in substantially horizontal and below horizontal dispositions. However flame spraying torches with air inlet apertures into their powder containers usually cannot be used in orientations that cause the powder to flow away from their outlets.

An object of this invention is to provide a simple and economical powder feeding device for mounting upon a flame spraying torch that dependably feeds powder without the necessity for any pressure equalizing air inlet opening into the powder container.

Another object is to provide such a device which helps to make the dispensing of powder more independent of container orientation.

In accordance with this invention the walls of the powder container mounted on a flame spraying torch and means that couple it thereto are substantially sealed to isolate the contents of the container from the atmosphere. A wall of the container is movably constructed to cause it to move inwardly when the internal pressure within the container is reduced by the dispensing of powder. Such movement minimizes the reduction of internal pressure to facilitate the exhaustion and dispensing of substantially all of the powder content into the powder supplying channel without requiring a pressure equalizing aperture. Such a movable wall may be elastic, resilient or collapsible with or without movement accommodating bellows formations, or it might be a sliding outer wall. It might also be an elastic or resilient diaphragm within the container that separates it into sealed and powder containing chambers.

Bellows may be confined to the end of the container remote from the coupling to maintain the portion adjacent the coupling smooth for facilitating the feeding of powder through it, and they may also be disposed upon the entire length of the wall for facilitating the substantially complete collapse of the container upon reduction of internal pressure, thereby promoting the substantially complete dispensing of the entire powder content regardless of orientation. The end of such a container remote from the coupling may also be made in a form that facilitates its concave deformation to help force any remaining powder into the neck upon the substantially complete collapse of the container whereby the confinement of said powder within said neck regardless of orientation is promoted.

A sealed container with a movable outer wall that does not completely accommodate changes in internal pressure can be adapted for feeding from inverted portions by extending a tube from the powder supplying channel within the container adjacent the end remote from the outlet. Such a container is so independent of orientation that it can feed powder even when completely inverted.

Novel features and advantages of the present invention will become apparent to one skilled in the art from a reading of the following description in conjunction with the accompanying drawings wherein similar reference characters refer to similar parts and in which:

FIG. 1 is a view in elevation of one embodiment of this invention partly broken away in cross section;

FIG. 2 is a top-plan view of the powder container relative to the disposition shown in FIG. 1;

FIG. 3 is a view in elevation of the powder container shown in FIGS. 1 and 2 removed from the torch;

FIG. 4 is an end view of the adjacent portion of the container shown in FIG. 3;

FIG. 5 is a top-plan view of the connecting area of the torch shown in FIG. 1;

FIG. 6 is a cross-sectional view taken through FIG. 5 along the line **6—6**;

FIG. 7 is a view in elevation of a portion of the embodiment shown in FIG. 1 when its internal pressure is reduced;

FIG. 8 is an inside-plan view of a cap for the container shown in FIGS. 2–4;

FIG. 9 is a cross-sectional view taken through FIG. 8 along the line **9—9**;

FIG. 10 is a view in elevation of a powder container that constitutes another embodiment of this invention;

FIG. 11 is a cross-sectional view taken through a powder feeding torch upon which the container shown in FIG. 10 is mounted in the form that it assumes upon a reduction in internal pressure;

FIG. 12 is a cross-sectional view in elevation of still another embodiment of this invention;

FIGS. 13 and 14 are cross-sectional views in elevation of a further embodiment of this invention in different phases of operation;

FIG. 15 is a cross-sectional view in elevation of still a further embodiment of this invention;

FIG. 16 is a view in elevation of a still further collapsible embodiment of this invention;

FIG. 17 is a cross-sectional view in elevation taken through the embodiment shown in FIG. 16; and

FIG. 18 is a view in elevation of the internal collapsible portion of the embodiment shown in FIGS. 16 and 17.

In FIG. 1 is shown a powder feeding device **10** mounted upon a flame spraying torch **12** which injects powder **14** from container **16** into the stream **18** of burning gas emitted from torch **12**. Powder **14** is injected into gas stream **18** by dispensing it from container **16** coupled to connecting portion **20** of torch **12** in communication with powder supplying channel **22** that intersects longitudinal gas conducting passageway **24** in torch **12**. The flow of powder through channel **12** is controlled by a valve (not shown) actuated by lever **26**.

As shown in FIGS. 1–6, container **16** is coupled to connector **20** by a coupling generally designated by arrow **28** in FIG. 1. Coupling **28** includes bayonet lugs **30** shown in FIGS. 3 and 4 on the neck **32** of container **16** engaged within slotted bayonet ring **34** disposed within connector **20** as shown in FIGS. 5 and 6. Coupling **28** provides a substantially air-tight seal. Connector **20** is secured

upon torch 12 by screw threads 35 that engage within corresponding internal screw threads 36 within the body of torch 12.

Container 16 is made of an elastic and resilient material such as polyethylene, and it is constructed to deform inwardly upon reduction of internal pressure as shown in FIG. 7. This condition occurs when powder 14 is withdrawn from container 16 thereby reducing the internal pressure below atmospheric pressure. The upper portion of the side wall 40 of container 16 is made in the form of bellows 36 for facilitating the inward deformation or collapse of container 16 that is illustrated in FIG. 7 and the subsequent outward movement of walls 40 and rear end 38 when pressure is equalized. Bellows 36 are confined to the portion of the container remote from coupling 28, and the portion of wall 40 adjacent coupling 28 is maintained smooth to facilitate dispensing of the powder.

As shown in FIG. 7, bellows 36 are compressed tightly upon each other, and the top end 38 and side wall 40 of container 16 are also slightly inwardly deformed because of the exhaustion of powder therefrom caused by its entrainment into gas passageway 24 through powder supplying channel 22. The inward deformation of the walls helps prevent a reduction of pressure in container 16 to such an extent that it permits the feeding of powder 14 into the gas stream before practically all of it is used. The need for any pressure equalizing aperture into container 16 is thereby eliminated. However a slight air passage through coupling 28 will insure that all powder 14 can be dispensed freely. Such a slight passage is disclosed and claimed in commonly assigned copending U.S. patent application Serial No. 309,502, filed September 17, 1963, now abandoned.

FIG. 7 shows the condition that exists when practically all of powder 14 is dispensed from container 16 during one feeding operation. However usually not all of the powder content is dispensed during one operation, and the pressure within the container is therefore restored before all of it is exhausted. This permits all of powder 14 within container 16 to be dispensed. This recharging of the pressure within the container can be accomplished through the heated tip 41 of torch 12, by tripping valve control lever 26 when the gas supply is shut off, thereby minimizing the moisture content in the recharging air. This maintains the contents of container 16 dry and prevents caking of the powder which would prevent its smooth and even dispensing. This powder feeding arrangement therefore provides a controlled atmosphere for storage of the powder that is not possible where an atmospheric pressure equalizing aperture is provided upon the container. A protective atmosphere such as nitrogen gas can be maintained within container 16 even after repeated use, which might somewhat dilute it with air during the aforementioned recharging but not completely neutralize it.

The appreciable inward deformation or collapse of container 16 also facilitates the confinement of the powder to the neck or outlet 32 of the container to such an extent that torch 12 can be oriented in dispositions in which the longitudinal axis of powder container 16 is substantially horizontally disposed. The lack of need for an equalizing aperture also avoids spillage of powder in such dispositions away from the vertical of the axis container 16. It is also believed that the rate of powder feed is increased by the substantially sealed container of this invention over containers fully open to atmosphere because it minimizes air dilution to permit more powder to be fed per unit time.

In FIGS. 8 and 9 is shown a cap 42 for sealing the neck 32 of container 16 when, as shown in FIG. 3, it is removed from torch 12. Cap 42 includes a slotted bayonet aperture 44 for engaging bayonet lugs 30 on neck 32 of container 16. Tapered plug 46 within cap 42 closely engages within neck 32 to seal the contents of container 16 from the atmosphere.

In FIGS. 10 and 11 is shown a modified container 16A that incorporates bellows 36A along the entire length of side wall 40A which is tapered inwardly toward neck 32A. Rear end 38A remote from neck 32A has a concave form. In FIG. 11 container 16A is shown in the form into which it collapses when it is mounted upon a torch 12A, which has dispensed most of its contents. Container 16A is capable of substantially complete collapse with end 38A entering in between collapsed bellows 36A to push the small remaining amount of powder 14A within connecting area 36A of torch 12A and into intimate contact with the entrance to powder supplying channel 22A. Powder is accordingly efficiently dispensed in a substantially uphill direction, which is completely impossible from prior fully vented powder feeding device.

In FIG. 12 is shown another embodiment 10B of this powder feeding invention which is similar to that described in FIG. 1 with the exception that a tube 50B is inserted within the throat 52B of connector 20B to permit device 10B to dispense powder to torch 12B in the inverted position shown in FIG. 12. A small recess 54B is disposed in the entrance to throat 52B for receiving the end of tube 50B, which is for example made of polyethylene. Such a tube of proper size can also be wedged securely into the curved entrance 54 to throat 52 of connector 20 shown in FIG. 6.

As shown in FIG. 12, end 56B of tube 50B remote from connector 20B is adjusted to be spaced a short distance from end 38B of container 16B when it is in the fully compressed condition. Tube end 56B is accordingly disposed approximately ⅛ inch from container end wall 38B when it is disposed in a partially compressed condition. Because container 16B is substantially completely sealed, powder 14B is entrained within tube 50B and moved upwardly against the force of gravity into powder supplying channel 22B and dispensed into longitudinal gas conducting passageway 24B. A remarkably simple and effective device for feeding powder from an inverted container is therefore provided. This is quite remarkable in view of the previous sensitivity of prior powder feeding torches to gravity flow.

In FIGS. 13 and 14 is shown another embodiment 10C of this invention, which is capable of dispensing powder from any orientation including inverted. Feeding device 10C incorporates container 16C having an internal elastic wall 56C which is for example a diaphragm of an elastic material such as rubber or neoprene sealed to walls 40C of container 16C. Diaphragm 56C divides container 16C into a pressure chamber 58C and a powder containing chamber 60C. Although chamber 58C is referred to as a pressure chamber, it might only be subjected to atmospheric pressure trapped within it at the time of sealing diaphragm 56C within container 16C.

Device 10C operates to urge powder 14C into neck 32C of container 16C regardless of orientation because as shown in FIG. 14 diaphragm 56C expands toward neck 32C as powder and pressure are withdrawn from powder containing chamber 60C. Diaphragm 56C might be elastic enough to extend completely through the exit of neck 32C when powder contents 14C are exhausted to force powder 14C into powder supplying channel 22C to maintain it closely packed with powder at all times. Complete dispensing of the powder 14C is accordingly assured regardless of container orientation. When diaphragm 56C is resilient, it snaps back into its original position shown in FIG. 13 when pressure is equalized. This can be accomplished through the heated tip of the torch to minimize the amount of water vapor drawn into container 16C. A partially full container 16C can be exhausted to the condition shown in FIG. 14 by inverting torch 12C and operating it until all air is exhausted and powder starts to flow into the emitted gas stream.

In FIG. 15 is shown another powder feeding device 10D in which movable wall 38D is a sliding end wall of container 16D that is sealed within cylindrical walls 40D by a sliding seal 60D incorporating an annular groove 62D.

Retaining ring 64D upon the end of wall 60D maintains sliding wall 38D inserted within container 16D when it is filled with powder 14D. Container 16D and wall 38D may be made of a plastic material such as polyethylene to facilitate their sealed sliding assembly. As powder 14D is exhausted from container 16D, atmospheric pressure reacting upon the outside of wall 38D forces it toward outlet neck 32D thereby maintaining powder 14D in intimate contact with powder supplying channel 22D to promote the full exhaustion of all powder from container 16D regardless of orientation. Since wall 38D does not move backward when pressures on both of its sides equalize, no air is pulled into container 16D upon equalization of pressure. This maintains its contents protected from atmospheric effects such as wetting and oxidation. The position of wall 38D also indicates the amount of powder remaining in the container without the necessity for having the walls transparent, and such position in conjunction with suitable indicia 66D upon walls 40D precisely indicate how much powder remains for dispensing.

In FIGS. 16 and 17 is shown another powder feeding device 10E in which the movable wall 38E is provided by a collapsible plastic sac. Plastic sac 38E is inserted within container 16E including a substantially rigid tube 68E engaged within outlet funnel 70E. Tube 68E is made for example of a substantially rigid plastic such as polystyrene or an acrylic, which might be transparent to permit the contents of container 16E to be directly observed. Plastic sac 38E, as shown in FIG. 18, is utilized as a storage container for powder 14E prior to usage as shown in FIG. 18. A clip 72E seals the top of sac 38A prior to use.

Sac 38E is secured within container 16E by locking its open edge 71E between flange 74E upon tube 68E and a corresponding lip 76E upon outlet funnel 70E. Outlet funnel 70E is secured to powder feeding section 12E by screw threads 78E upon its discharge end. Outlet funnel 70E is made of a resilient material such as rubber or neoprene to facilitate the snap fitting of the lower end 74E of tube 68E into and out of engagement with lip 76E.

FIG. 17 shows the condition of container 16E after a substantial amount of powder 14E has been discharged into the gas stream admitted to the torch (not shown). Plastic sac 38E, for example made of inexpensive polyethylene, has substantially collapsed to help urge the powder within it into the discharge outlet 70E thereby helping insure that all powder is discharged from the container and minimizing the influence of gravity. The arrangement shown in FIGS. 16–18 is somewhat similar to a type of baby nursing kit, but it is rather surprising that a type of feeding device intended for a liquid will prevent an undue reduction of pressure within a powder feeding container. A metal powder is in no way comparable to a liquid such as milk, and there was no disclosure of suggestion prior to this invention that a collapsible feeding sac would prevent an undue reduction in pressure within an alloy powder feeding container of a flame spraying torch.

What is claimed is:

1. A flame spraying torch comprising a tip section for ejecting flames therefrom, a powder injection section connected to said tip section, gas supply connecting means connected to said powder injecting section, a gas conduit communicating with said gas supply connecting means and extending through said powder injecting section and through said tip section, a powder container detachably mounted upon said powder injecting section whereby said container may be detached and utilized for storage of powder, a powder passageway communicating with said powder container and with said conduit whereby powder may flow from said container into said conduit, said container having a freely disposed end wall and a collapsible peripheral side wall and pressure reduction means for contracting the peripheral side wall of the powder container axially with portions of the contracting wall maintained spaced from opposite portions of said wall whereby flow of powder to the discharge end of said container from its axially opposite end is uninterrupted by the contracting action of said wall.

2. A torch as set forth in claim 1 wherein said powder container is mounted at an angle with respect to said powder injecting section.

3. A torch as set forth in claim 1 wherein said container is mounted under said powder injecting section with its discharge end disposed above the contracting wall.

4. A torch as set forth in claim 1 wherein a tube extends from the connecting area of said container and said powder injecting section in sealed communication with said powder supplying channel and extending into said container, and the end of said tube remote from said connecting area extending adjacent to said end wall of said container remote from said connecting area for conducting powder therefrom into said powder supplying channel whereby said device dispenses said powder independently of gravity.

5. A torch as set forth in claim 1 wherein said collapsible side wall is a resilient bellows formation.

6. A torch as set forth in claim 5 wherein said end wall of said container is concavely shaped.

References Cited by the Examiner

UNITED STATES PATENTS

1,854,458	4/1932	Quincy et al.	222—386.5 X
2,649,995	8/1953	Muskin	222—386.5 X
2,671,689	3/1954	Wett	239—85
2,696,337	12/1954	Dinhofer	222—215 X
2,738,107	4/1956	Graham	222—215
2,743,038	4/1956	Ferries	222—215 X
2,781,154	2/1957	Meredith	222—193
2,784,882	3/1957	Du Bois	222—215
2,793,778	5/1957	Maxwell	215—11
2,899,110	8/1959	Parker	222—215
2,934,632	4/1960	Todd	222—193 X
2,965,268	12/1960	Bauerlein	222—193
3,143,429	8/1964	Swanson et al.	222—215 X
3,155,281	11/1964	Stracey	222—212 X

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