Oct. 29, 1968 S. BALOGH 3,407,936

SPRING LOADED DRYER

Filed June 7, 1965 2 Sheets-Sheet 1

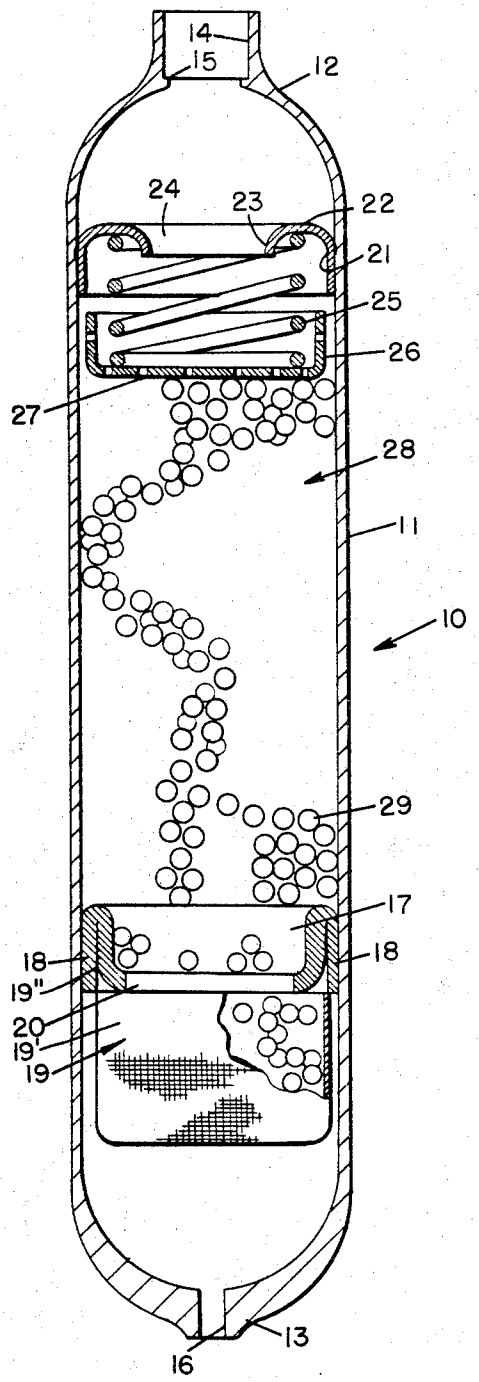

Fig. 1

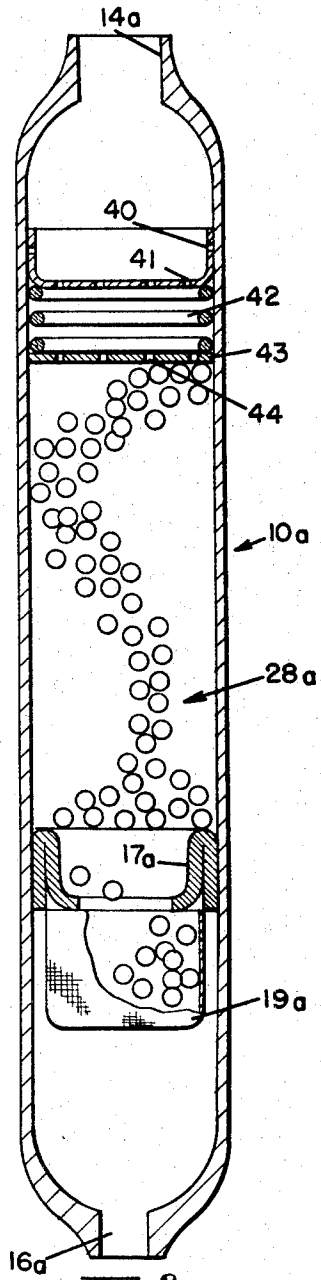

Fig. 2

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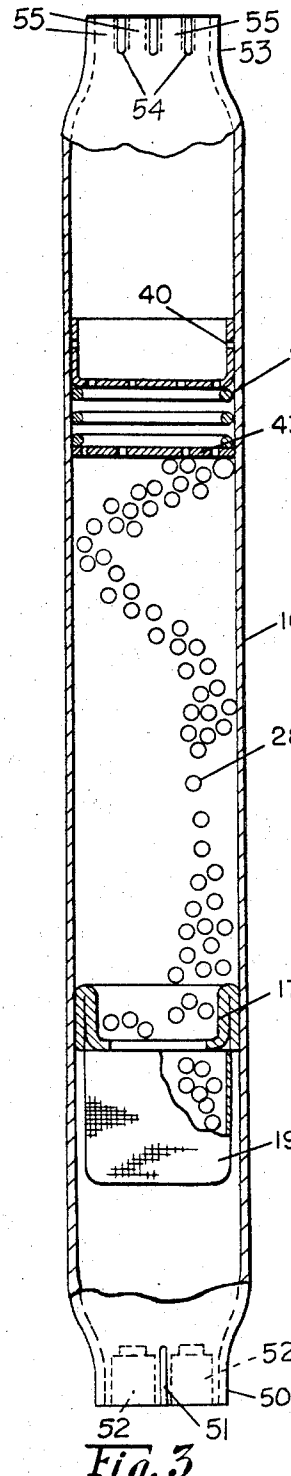

Fig. 3

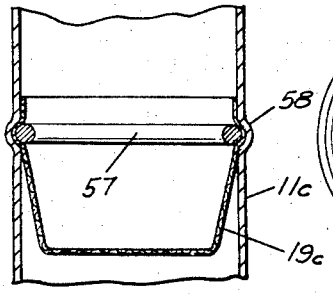

Fig. 5

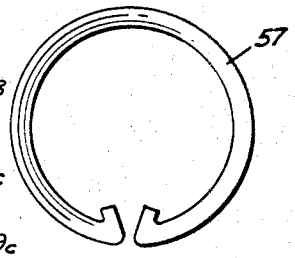

Fig. 6

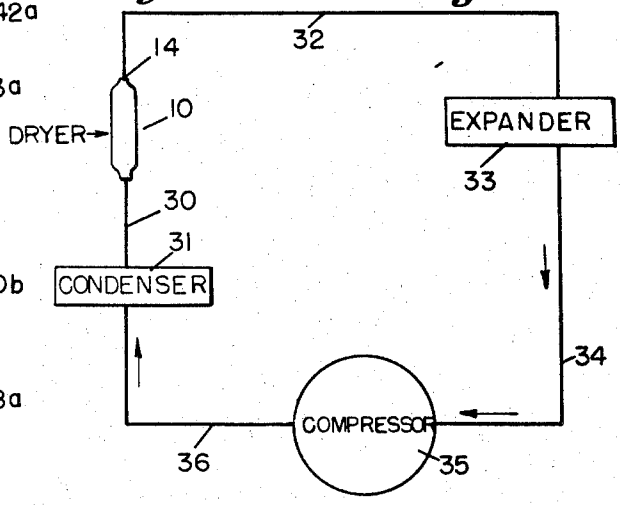

Fig. 4

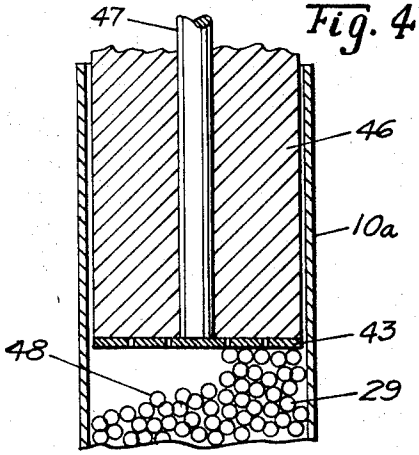

Fig. 7

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SPRING LOADED DRYER

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5 Claims. (Cl. 210—282)

ABSTRACT OF THE DISCLOSURE

A refrigerant dryer is provided, having a tubular body and a cup-shaped desiccant retainer adhered to an inner wall of the body, with a spring retainer adhered to an opposite end of the body, having a spring engaged therewith and also engaged with the perforated disk, for compressing desiccant particles between the retainers and urging the same toward and into the cup-shaped retainer. The particles may be initially compressed by inserting a disk into the body, which is magnetically adhered to a magnetic rod, during the compacting of the particles, with the rod being then withdrawn and a spring inserted for engagement against the disk, that end of the body then being closed.

This invention relates to dryers adapted for use in refrigerating systems and to the method of making the same.

An object of the invention is to provide a dryer using loose desiccant particles and wherein the particles are compacted under spring pressure to prevent movement thereof which would otherwise produce powdering thereof.

Another object is to provide a dryer of the type described in which a screen for retaining the desiccant particles is anchored within a tubular shell inwardly and independently of the adjacent end structure of the shell.

Another object is to provide a dryer of the type described in which there is a screen near one end of a tubular shell for retaining the desiccant particles and there is a retainer near the other end of the shell for retaining a spring that applies compacting pressure to the desiccant particles, both the screen and retainer being anchored to the tube inwardly and independently of the end structure of the shell.

Another object is to provide a dryer comprising a one-piece tubular shell with a screen for retaining desiccant particles anchored near one end thereof, spring means at the other end of the shell for compacting the desiccant beads, and with each end of the shell deformed for forming means whereby a conduit may be attached thereto.

Another object is to provide a method of making a dryer wherein desiccant retaining and compacting means are mounted within a tube and the ends of the tube are then deformed for providing inlet and outlet ports.

Another object is to provide a method of making a dryer wherein a desiccant retaining screen is anchored within a tube near one end thereof, desiccant particles are inserted, and a baffle plate is then inserted through the other end of the tube by means of a magnetic plunger that holds the baffle plate normal to the axis of the tube while the baffle plate engages the desiccant particles for compacting the same.

A still further object of the invention is to provide a dryer that is sturdy and durable in construction, reliable and efficient in operation, and simple and inexpensive to manufacture, assemble and utilize.

Other objects will in part be obvious, and in part be pointed out in the accompanying drawings and described hereinafter.

In the drawings:

FIG. 1 is a longitudinal sectional view through one form of dryer constructed in accordance with the instant invention.

FIG. 2 is a slightly modified form of dryer construction.

FIG. 3 is a similar view showing a still further modified form of the invention, and,

FIG. 4 is a schematic diagram showing a preferred location of a dryer in a refrigerating system.

FIG. 5 is a fragmentary section view showing an alternate method of anchoring the desiccant retainer screen within the tubular shell by means of split spring ring.

FIG. 6 is a plan view of the split spring ring of FIG. 5, and

FIG. 7 is a view showing the method of initially compacting the desiccant particles.

With reference to FIG. 1, the dryer is generally indicated at **10** and consists of a tubular shell **11** with reduced ends **12** and **13**. The shell is preferably made from a tube of uniform inside and outside diameter whose ends before such reduction are shown by the dotted lines in FIG. 1. The end **12** comprises the inlet having a relatively large opening **14**, and an internal shoulder **15**. An inlet conduit may be attached at the opening **14** in any desired conventional manner. The end **13** is provided with a restricted outlet opening **16**.

Spaced from outlet end **13** is an annular screen holder **17** having a reverted outer fold **18** that clamps the upper edge of a cylindrical cup-shaped screen **19** having a cup-like portion **19'** and a rim portion **19''**, that serves as a strainer and a desiccant retainer, there being a relatively large opening **20** in the base of screen holder **17**. The latter is anchored in a fixed position within the bore of the tube, preferably by press fitting, but alternatively may be soldered, expanded, or otherwise secured to the wall of the tube. Furthermore, holder **17** is positioned a sufficient distance from end **13** to permit reducing of the latter without contacting screen **19**.

At the opposite end of the tubular shell **11** a spring retainer **22** is press fitted within the bore of the shell. It has inwardly extending top wall **22** which is reverted downwardly as at **23** and has a relatively large inlet opening **24**. A compression spring **25** has one end in engagement with rim **23** and its other end in engagement with a cup-shaped baffle **26**, the cylindrical wall of the baffle being a close sliding fit within the bore of the tubular shell so as to maintain the bottom wall of the baffle normal to the axis of the shell, such bottom wall having a plurality of perforations **27**. Positioned between the screen **19** and the baffle **27** is a desiccant material generally indicated at **28**, and comprised of closely packed particles **29**, which serve to absorb water from refrigerant fluid passing through the dryer. The desiccant particles may be synthetic zeolite, activated alumina, silica gel or the like, and the position of retainer **21** is selected so that tension of the spring is regulated to pack the desiccant particles as tightly as possible without crushing. Also, spring retainer **21** is spaced a sufficient distance from the upper end of the tube, so as not to interfere with reducing of the same when forming opening **14**.

In the preferred method of making the dryer, screen **19** is first attached to screen holder **17** by clamping the upper edge between the inner and outer folds of the holder. Holder **17**, with the screen attached, is then press fitted within the bore of tube **11**, whose ends at this time are not reduced, for anchoring the same at a location where screen **19** is spaced inwardly from the lower end of tube **11**. Desiccant particles are then inserted from the upper end of the tube, followed by insertion of baffle **26** and spring **25**. Baffle **26**, which is preferably of brass, may be pressed against the desiccant particles by a rod (not shown), the close fit of the cylindrical portion of the baffle with the inside of the tube maintaining the bottom wall of the baffle perpendicular to the axis of the tube during this initial compacting of the desiccant. Spring retainer **21** is then press fitted within the bore of the tube

in the position shown in FIG. 1, in which it compresses spring **25** to exert the desired pressure upon the desiccant particles via baffle **26**. The ends **12** and **13** of the tube are then reduced so as to form inlet and outlet openings **14** and **16**.

In variations of this method screen holder **17** with screen **19** attached may be pressed into tube **11** as aforesaid and lower end **13** reduced before insertion of the remaining components, or lower end **13** may be reduced prior to insertion of the screen and screen holder.

In the use and operation of the device the dryer is positioned as indicated in FIG. 4 at **10** in the line **30** for refrigerant fluid which leads from the condenser **31**. From the outlet **13** a line **32** extends to the expander **33**, from which a line **34** leads to the compressor **35**, and thence from the compressor, a line **36** leads back to condenser **31**. There is thus provided a closed system, and the desiccant particles **29** serve to remove water from the refrigerant fluid. Perforated baffle **26** stops any large particles of foreign matter in the refrigerant fluid from going downstream to the expander while screen **19**, which is of fine mesh, serves to retain any particles of desiccant or small particles of foreign matter from going downstream.

FIG. 2 discloses a modified form of the dryer in which spring retainer **40** is in the form of a baffle in that it has small perforations **41** rather than the large opening **24** of spring retainer **22**. Also baffle **43** is simply a flat disk with perforations **44** and whose periphery has a close clearance with the wall of tubular shell **10***a*. In this case, baffle **43** may be made of magnetic steel and inserted into tube **10***a* by means of a magnetic rod **46**, as illustrated in FIG. 7. During such insertion baffle **43** adheres to rod **46** by magnetic attraction and remains in a plane perpendicular to the axis of tube **10***a* while compacting desiccant particles **29**, thus leveling the upper surface **48** of the desiccant which may initially be irregular, as shown. Without such magnetic attraction baffle **43** would have to have a cylindrical skirt, as in the case of baffle **26**, to maintain it in the perpendicular position. After the desiccant has been initially compacted, plunger **47** is held against baffle **43** to hold the latter in position and rod **46** is raised, releasing it from the baffle. Rod **46** and plunger **47** are then withdrawn.

FIG. 3 discloses a further modified form of the invention including a tube **10***b* within which is contained desiccant **28***b* which is retained between cup-shaped screen **19***b* attached to screen holder **17***b* and baffle **43***a* pressed by spring **42***a* which butts against spring retainer **40**. In this modification the ends are specially adapted for systems employing more than one inlet and outlet. Where two outlet tubes are employed for example, the end is flattened as at **50**, and centrally crimped as at **51** to provide two central outlet openings **52**. The opposite end or inlet end may be similarly flattened as at **53** and crimped as at **54** in three positions, longitudinally of the tube, to provide four separate tubular passages **55** which may be connected to several inlets as desired. Obviously any number of inlet or outlet conduits may be provided in accordance with the specific system with which the device is adapted to be utilized.

FIG. 5 illustrates an optional method of anchoring a cup-shaped screen **19***c*, which corresponds to screen **19** of FIG. 1, within tubular shell **11***c*. In this case a split spring ring **57** exerts radially outward pressure to clamp the upper rim of screen **19***c* against the inner wall of shell **11***c*. The latter may have an outwardly formed bead **58** for receiving the ring **57** and screen rim, although such bead **58** is not required in all instances.

From the foregoing it will be seen that there is herein provided an improved spring loaded dryer which accomplishes all the objects of this invention, and others, including many advantages of great practical utility and commercial importance.

As many embodiments may be made of this inventive concept, and as many modifications may be made in the embodiment hereinbefore shown and described, it is to be understood that all matter herein is to be interpreted merely as illustrative and not in a limiting sense.

I claim:

1. The method of making a dryer comprising inserting and anchoring a perforated retainer within a tube near one end thereof, inserting desiccant material in the tube against said retainer, inserting a perforated baffle of magnetic material into the other end of the tube and pressing it against the desiccant material by means of a magnetized rod to which said baffle is magnetically adhered, separating the rod from the baffle and withdrawing the rod from the tube while the baffle remains in place against the desiccant material, inserting a spring means against the baffle, and providing an inlet port at said other end of the tube.

2. The method of making a dryer comprising inserting and anchoring a perforated desiccant retainer within a tube inwardly of the end thereof, inserting desiccant material into the tube against said retainer, inserting a disk against the desiccant material and compacting the latter with said disk, said disk being magnetically adhered to a rod, releasing the rod from the disk and withdrawing the rod from the tube, inserting a spring against the disk, inserting and anchoring a spring retainer in the tube in a position compressing the spring whereby the disk exerts compacting presure upon the desiccant material, and deforming both ends of the tube radially inwardly to form ports communicating with the interior of the tube.

3. A dryer comprising a tubular shell having a cylindrical body between a pair of ports for fluid flow, a cup-shaped desiccant retainer fixed to the shell bore near one end thereof, said retainer having a cylindrical perforated wall spaced from said bore and having a closed end facing said one end of the shell, a spring retainer fixed to the shell near the other end thereof, a movable perforated baffle spaced inwardly of the spring retainer, loose desiccant particles in the shell between said baffle and said cup-shaped retainer and filling the latter, and a spring between the spring retainer and baffle and forcing the baffle against the desiccant particles to compact the same.

4. The dryer of claim **3** in which said spring is coil shaped and has a diameter substantially that of the bore whereby subtantially all fluid passing through said shell passes into the spring at one end thereof and passes out of the spring at the other end thereof.

5. The dryer of claim **3** in which said cup-shaped retainer has a rigid rim at the open end thereof press-fitted to the shell, said cylindrical wall of the cup-shaped retainer extending a substantial distance from said rim toward said one end of the shell to provide substantial flow area through said cylindrical wall for said fluid.

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