Aug. 4, 1959 E. JONES ET AL 2,897,642

METHOD AND APPARATUS FOR PRESSURIZING DRIERS

Filed Jan. 14, 1958

Fig-1

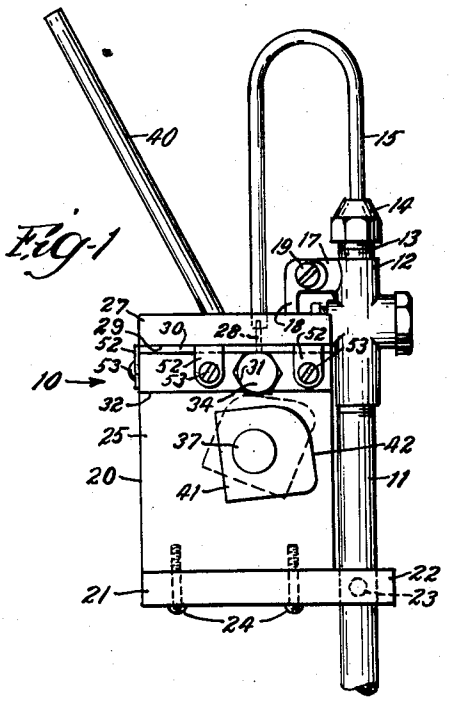


Fig-2

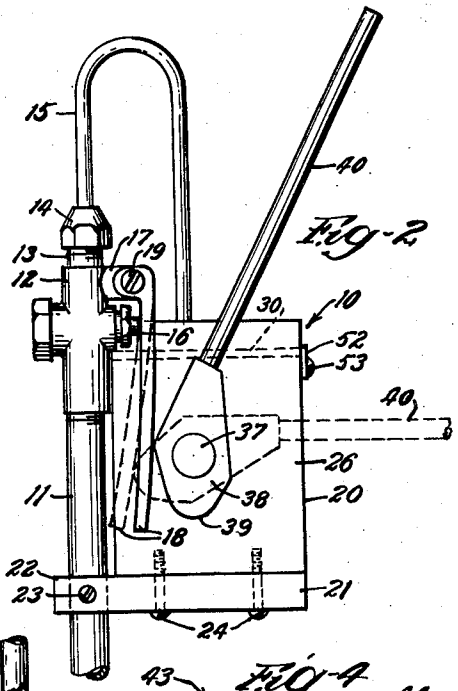


Fig-3

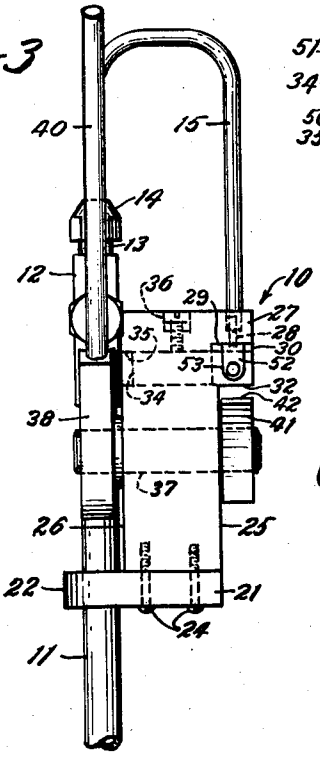


Fig-4

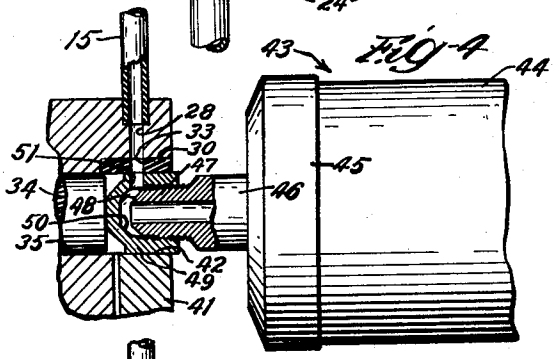
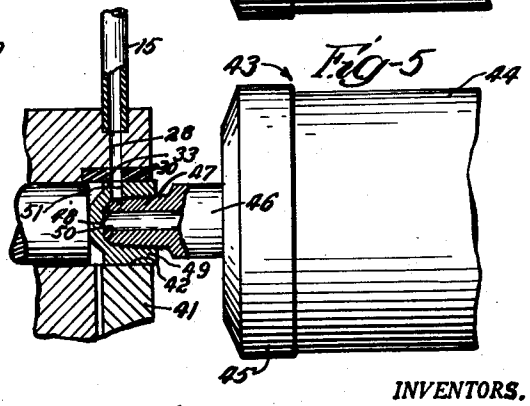


Fig-5



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METHOD AND APPARATUS FOR PRESSURIZING DRIERS

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11 Claims. (Cl. 53—7)

The present invention is directed to a new and improved method for use in gas pressurization of an article, such as a refrigerant drier, and a preferred embodiment of apparatus for carrying out this method, the apparatus constituting an important part of the present invention.

As fully disclosed in U.S. Patent 2,283,989, the provision of internally trapped pressurized gas, such as air in a refrigerant dehydrator or drier has particular utility as a means of identifying the condition of the drier immediately prior to installational use of the same. In following standard manufacturing procedures, the completely assembled drier is sealed at the ends thereof to prevent loss of efficiency of the desiccant contained therein by moisture absorption during storage and shipment. Prior to complete closing of the drier as fully disclosed in the aforementioned patent, a charge of gas is introduced into the drier under pressure immediately followed by closing or sealing of the drier to trap the pressurized gas therein. When the drier is opened for installation in a refrigeration system, the trapped gas escapes therefrom providing a readily identifiable means of indicating the condition of the drier. Generally, the gas is under sufficient pressure to supply an audible sound, such as a "hiss," which immediately conveys to the installer the fact that the desiccant is in good condition for efficient dehydrating functioning. If there are any leaks in the drier as manufactured or as developed as a result of storage and shipping handling, the pressurized charge contained therein will be dissipated and the absence of its audible escape from the drier upon installation of the same conveys to the installer the fact that the drier may not function properly in the system. While this particular function of the pressure charge is of primary importance, other functions, as specified in the aforementioned patent, can be attributed to the use of such a charge, but in this respect the present invention is concerned solely with a method and apparatus of providing an article such as a drier with the pressure charge.

It is an object of the present invention to provide a method of pressurizing an article, such as a refrigerant drier, in an efficient and inexpensive manner whereby the drier is provided with a means for indicating the condition of the same prior to immediate installational use thereof.

Still further, it is an object of the present invention to provide a new and improved method of supplying to an article, such as a refrigerant drier, an internally trapped pressurized gas charge, the steps of the method including a procedure whereby the charge is efficiently introduced into the drier while the same is in a partially opened condition, the drier being immediately closed to not only trap the pressure charge therein but further seal the drier and complete assembly of the same in a single step operation.

A further important object of the present invention is to provide article pressurization apparatus particularly adapted for pressurizing a refrigerant drier, the apparatus

being of uncomplicated and inexpensive structural arrangement to provide quick and efficient drier assembly completion simultaneous with pressurization of the same.

Another object of the present invention is to provide new and improved apparatus for pressurizing refrigerant driers which include nipple-carrying end caps fixed to a tubular casing in which desiccant is packed, the nipples having threadedly received thereon sealing nuts one of which is initially tightened to close and seal one end of the drier and the other of which is carried by its nipple in a loosened condition for pressurization of the drier, the loosened nut being provided with a gas delivery opening which is in communication with the interior of the drier in the loosened condition of the nut and which is out of communication with the interior of the drier when the nut is tightened into sealed relation with the end of the nipple, the apparatus further including means for fixedly receiving the loosened nut in filling opening alignment with gas delivery means to supply the interior of the casing with a positive charge of gas, the nut receiving means holding the same against rotation and in communication with the gas delivery means during subsequent tightening of the nut on its nipple in sealed relation therewith to trap the positive charge within the drier.

Other objects not specifically set forth will become apparent in the following detailed description of the invention made in conjunction with the drawings wherein:

Fig. 1 is a side elevation of the apparatus in its mounted position on a gas delivery line;

Fig. 2 is an elevational view of the other side of the apparatus opposite to that illustrated in Fig. 1;

Fig. 3 is an end view of the apparatus as viewed toward the right in Fig. 1;

Fig. 4 is an enlarged fragmentary and partly sectioned view of the operational functioning of the apparatus illustrating use of the same in conjunction with an end seal cap of a refrigerant drier during pressurization of the drier; and

Fig. 5 is a view similar to Fig. 4 illustrating completion of the gas pressurization operation and end cap sealing of a refrigerant drier.

In Figs. 1–3 an article pressurizing unit, generally designated by the numeral **10**, is illustrated as mounted to a gas supply means including a vertically directed pipe or line **11** having threadedly received at the top thereof a control valve assembly **12**. The top portion of the valve assembly **12** has threadedly received therein a nipple **13** to which is attached a flare nut **14** engaging therewith in sealed relation a gas line **15** for attachment to the unit **10**.

The control valve **12** is provided with an operating stem **16** (see Fig. 2) which is spring urged outwardly of the valve housing into valve closing position. The structural features of the valve unit **12** do not constitute a part of the present invention and it will be understood that any suitable valving means capable of controlling the delivery of gas from the line **11** may be used as long as the valve includes a type of control means similar to that to be described. The top portion of the valve housing is provided with a radially outwardly directed lever mounting ear **17** which has pivotally attached thereto the upper end of a valve operating lever **18** by means of a fastener **19**. The lever **18** is arranged to rest against the outermost end of the reciprocal valve stem **16** to depress the same in a manner to be described to open the valve **12** and allow gas to flow from line **11** into line **15**.

The unit **10** includes a block-like housing **20** supported by a mounting plate **21** which is provided with a radially directed ear portion **22** received about the pipe **11** and fixed thereto by a set screw **23**. The block **20** is attached to the plate **21** by a plurality of fasteners **24** which are re-

movable for block replacement purposes for use with different size end sealing nuts carried by articles to be pressurized in the manner to be described.

Opposite sides **25** and **26** have elements associated therewith which are of particular importance in the operation of the unit **10**. The upper marginal portion of the side **25** has integrally formed therewith an outwardly projecting rib-like portion **27** through the top surface of which extends the remaining end of the gas delivery line **15** in communication with a downwardly directed drilled passageway **28** as particularly shown in Figs. 4 and 5. The opening **28** is in communication with a transverse slot **29** formed in the rib **27** and which has received therein a resilient cushion **30** of rubber or rubber-like material.

Centrally of the rib **27** and below the slot **29** is an hexagonally shaped recess **31**, the upper portion of which is open and communicates with the slot **29** and the lower portion of which is open and in communication with the bottom surface **32** of the rib **27**. The recess **31** is, in effect, a two sided slot each side of which is substantially V-shaped to conform with the outer configuration of a hex nut either of the cap or flare variety. The drilled opening **28** communicating with the line **15** further communicates with an opening **33** in the cushion **30** as particularly shown in Figs. 4 and 5. With this arrangement, gas from the line **15** is delivered through the cushion **30** into the top of the recess **31**.

The rear wall of the recess **31**, as particularly shown in Figs. 4 and 5, is formed by a movable insert **34** which is received in a drilled passageway **35** extending through the housing **20**. The position of the insert **34** is fixed by a set screw **36** (Fig. 3) extending downwardly from the top surface of the housing **20** and the location of the insert **34** will depend upon the extent to which the sealing nut of the article to be pressurized is received within the recess **31**.

The block **20** carries a transverse shaft **37** suitably journalled therethrough for pivotal rotational movement with the ends of the shaft extending outwardly beyond each of the side surfaces **25** and **26**. The end of the shaft associated with the side surface **26** fixedly carries a lever operating cam **38** which, as particularly shown in Fig. 2, is provided with a curved camming surface **39** for engagement with the outer surface of the valve lever **18** to move the same in a direction toward the pipe **11** as illustrated in broken lines in Fig. 2. A portion of the cam **38** has attached thereto an operating lever **40** which when moved downwardly into the position illustrated in broken lines in Fig. 2 brings the camming surface **39** into engagement with the lever **18** and moves the same toward the pipe **11**. Pivotal movement of the lever **18** about its fastener **19** compresses the stem **16** and opens the valve **12** to permit gas delivery under pressure into the line **15** and from there into the recess **31** through the opening **28** in the rib **27** and the opening **33** in the cushion **30**.

Movement of the lever **40** as described results in rotation of the shaft **37** and simultaneous rotation of a sealing nut clamping cam **41** which, as particularly shown in Figs. 1 and 3, is carried on the opposite end of the shaft **37** in association with the side surface **25**. The cam **41** is provided with a camming surface **42** which moves into sealing nut engagement, as shown in Figs. 4 and 5, in association with the bottom opening of the recess **31** to close the same. With downward movement of the lever **40** the cams **38** and **41** are simultaneously moved into operative positions resulting in gas delivery into the recess **31** accompanied by sealing nut clamping relative to the gas delivery openings **28** and **33**.

Figs. 4 and 5 better illustrate the filling and sealing operations. A conventional form of refrigerant drier, generally designated by the numeral **43**, is partially illustrated as including a sleeve-like casing **44** in which is received the dehydrating material, such as silica gel, the casing at each end thereof being provided with a fixedly attached end cap **45** which has formed therewith an outwardly projecting attaching nipple **46** having an outer end threaded portion **47** provided with a frusto-conical sealing seat **48**. The sealing nipples **46** at each end of the drier **43** have received thereon hex cap nuts **49** of known structure which are provided with cooperating inner sealing seats **50** for tight sealing engagement with the seats **48** upon closing of the nuts **49** by threadedly advancing the same toward the end caps **45**. The side skirt portion of at least one of the nuts **49**, as shown in Figs. 4 and 5, is further provided with a radially drilled opening **51** which is in communication with the interior of the nut when the same is loosened, as shown in Fig. 4. In this manner pressurized gas is delivered into the interior of the nut **49**, through the nipple **46** and into the casing **44** of the drier **43**.

The particular structural arrangement illustrated is fully disclosed in U.S. Patent 2,283,989 and it should be understood that while the use of a cap nut is illustrated, any suitable closure means capable of providing the desired function to be described can be efficiently used to allow pressurization of an article and subsequent closing of the article to trap the pressurized gas therein. In this respect, the commonly known type of seal bonnets held for sealing engagement by a flare nut can readily be utilized. If the particular closure means used is of such a structure as to require being received further into the recess **31**, the positionable insert **34** may be suitably located by the use of the set screw **36** in any desired position to regulate the depth of the recess **31**. The exact positioning of the insert **34** will control automatic alignment of the gas delivery opening **51** of the sealing nut with the opening **33** in the cushion **30**.

As fully disclosed in the aforementioned patent, the end structures of a refrigerant drier are identical and the opposite end sealing nut, which is not illustrated, is advanced into tight sealing engagement with its nipple to complete and seal this end of the drier against the escape of gas therefrom. The remaining end of the drier, as illustrated in Fig. 4, has the nut **49** loosely received on the nipple **46** to allow delivery of the gas into the interior of the casing **44**. The nut **49** and associated end portion of the nipple **46** is received in the recess **31** with the openings **33** and **51** in gas delivery alignment. The lever **40** is moved downwardly, as illustrated in Fig. 2, to rotate the shaft **37** and bring the cam **38** into lever depressing operation. Simultaneously, the cam **41** moves into locking engagement with the bottom surface of the nut **49** to slightly press the same upwardly into compression with the cushion **30** to completely seal the area immediately surrounding the aligned openings **33** and **51** against gas leakage during delivery of the same into the drier. The camming face **42** of the cam **41** provides a slight lifting action to compress the cushion and establish and maintain adequate sealing action to prevent gas leakage during drier pressurization.

Equalization of gas pressure in the line **11** and the drier casing **44** will occur almost immediately and in order to trap the pressurized gas in the casing **44**, the drier itself is rotated relative to the sealing nut **49** to bring the sealing surfaces **48** and **50** into tight engagement and close off the inner end of the gas delivery opening **51**. During sealing nut tightening for gas trapping purposes, as illustrated in Fig. 5, the nut locking cam **41** is retained in operative position to maintain gas delivery alignment and the lever operating cam **38** continues to depress the lever **18** to supply gas pressure through the line **15**. In this respect, a positive gas pressure is delivered at all times into the opening **51** of the nut **49** to prevent any possible loss of gas from the drier **43** during the tightening of the nut **49**. The nut locking cam **41** further functions to hold the nut **49** against rotation during tightening of the same. Upon completion of the nut tightening operation, the lever **40** is moved upwardly into its original position to release the lever **18** resulting in the closing of the valve **12**. Simultaneously, the nut locking cam **41** is moved

out of engagement with the nut 49 and the latter is released for immediate withdrawal from the recess 31.

During extended use of the unit 10, it may be necessary from time to time to replace the cushion 30. This cushion is freely received in the slot 29 and held therein by removable clamps 52 attached by fasteners 53. The recess 31 is designed for use with only one size of sealing nut and in normal production where different size articles are pressurized with such articles being provided with different size end sealing nuts, it is necessary to provide a number of units 10 each having a different size recess to accommodate the variety of sealing nuts. The block 20 may be readily detached from the mounting plate 21 by removal of the fasteners 24 and disengagement of the flare nut 14 from the nipple 13. In this respect several blocks 20 may be provided each of which has a recess 31 capable of receiving a sealing nut of different size. The apparatus described is inexpensively constructed and maintained while being capable of providing highly efficient functioning for gas pressurization of articles, such as refrigerant driers.

Obviously many modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

We claim:

1. Article pressurizing apparatus for use with an article provided with a rotatably closable sealing means through which a gas may be introduced into the article when said sealing means is at least partially open and trapped in said article upon rotatable closing of said sealing means, said apparatus comprising gas delivery means controlled by valve means, receiving means for said sealing means in communication with said gas delivery means, releasable holding means associated with said receiving means to fix said sealing means therein for article pressurization therethrough and subsequent rotational closing of same, and operating means for said valve means to control the delivery of gas into said article through said sealing means.

2. Article pressurizing apparatus for use with an article provided with a rotatably closable sealing means through which a gas may be introduced into the article when said sealing means is at least partially open and trapped in said article upon rotatable closing of said sealing means, said apparatus comprising gas delivery means controlled by valve means, receiving means for said sealing means in communication with said gas delivery means, releasable holding means associated with said receiving means to fix said sealing means therein for article pressurization therethrough and subsequent rotational closing of same, and operating means for said valve means to control the delivery of gas into said article through said sealing means, said holding means and said operating means being operatively connected for simultaneous operation.

3. Article pressurizing apparatus for use with an article provided with a rotatably closable sealing means through which a gas may be introduced into the article when said sealing means is at least partially open and trapped in said article upon rotatable closing of said sealing means, said apparatus comprising gas delivery means controlled by valve means, receiving means for said sealing means in communication with said gas delivery means, releasable holding means associated with said receiving means to fix said sealing means therein for article pressurization therethrough and subsequent rotational closing of same, resilient means forming a part of said receiving means to cushion and seal said sealing means relative to said gas delivery means upon operation of said holding means, and operating means for said valve means to control the delivery of gas into said article through said sealing means.

4. Article pressurizing apparatus for use with an article provided with a rotatably closable sealing means through which a gas may be introduced into the article when said sealing means is at least partially open and trapped in said article upon rotatable closing of said sealing means, said apparatus comprising gas delivery means controlled by valve means, receiving means for said sealing means in communication with said gas delivery means, releasable holding means associated with said receiving means to fix said sealing means therein for article pressurization therethrough and subsequent rotational closing of same, resilient means forming a part of said receiving means to cushion and seal said sealing means relative to said gas delivery means upon operation of said holding means, said holding means and said operating means being operatively connected for simultaneous operation.

5. Apparatus for use in gas pressurization and sealing of a refrigerant drier which includes a casing containing desiccant and end caps provided with threaded nipples on which sealing nuts are received for pressure tight sealing engagement with seat formed on the ends of said nipples, said apparatus comprising a block-like housing detachably mounted on a gas delivery pipe in association along one side thereof with a control valve mounted in said pipe and controlling gas delivery therefrom, the side of said housing opposite said one side being provided with a projecting rib-like portion the bottom surface of which overhangs said opposite side, a recess in said projecting portion defined by surfaces which conform to the configuration of a sealing nut to rotationally fix the same upon receiving a nut therein, the bottom portion of said recess being open and coinciding with the bottom surface of said projecting portion, the top portion of said recess being in communication with a resilient cushion provided with an opening for alignment with a corresponding opening in a sealing nut and which further is in communication with said pipe through a delivery line portion received in the upper surface of said projecting portion, and camming means on each side of said housing in operative alignment with said control valve to deliver gas into said recess and with the open bottom portion of said recess to urge a nut into resilient seating engagement with said cushion to provide a seal around the aligned openings thereof for gas delivery purposes.

6. Apparatus for use in gas pressurization and sealing of a refrigerant drier which includes a casing containing desiccant and end caps provided with threaded nipples on which sealing nuts are received for pressure tight sealing engagement with seats formed on the ends of said nipples, said apparatus comprising a block-like housing detachably mounted on a gas delivery pipe in association along one side thereof with a control valve mounted in said pipe and controlling gas delivery therefrom, the side of said housing opposite said one side being provided with a projecting rib-like portion the bottom surface of which overhangs said opposite side, a recess in said projecting portion defined by surfaces which conform to the configuration of a sealing nut to rotationally fix the same upon receiving a nut therein, the bottom portion of said recess being open and coinciding with the bottom surface of said projecting portion, the top portion of said recess being in communication with a resilient cushion provided with an opening for alignment with a corresponding opening in a sealing nut and which further is in communication with said pipe through a delivery line portion received in the upper surface of said projecting portion, and camming means on each side of said housing in operative alignment with said control valve to deliver gas to said recess and with the open bottom portion of said recess to urge a nut into resilient sealing engagement with said cushion to provide a seal around the aligned openings thereof for gas delivery purposes, said camming means being arranged for simultaneous operation.

7. Apparatus for use in gas pressurization and sealing of a refrigerant drier which includes a casing containing desiccant and end caps provided with threaded nipples

on which sealing nuts are received for pressure tight sealing engagement with seats formed on the ends of said nipples, said apparatus comprising a block-like housing detachably mounted on a gas delivery pipe in association along one side thereof with a lever operated control valve mounted in said pipe and controlling gas delivery therefrom, the side of said housing opposite said one side being provided with a projecting rib-like portion the bottom surface of which overhangs said opposite side, a recess in said projecting portion defined by surfaces which conform to the configuration of a sealing nut to rotationally fix the same upon receiving a nut therein, the bottom portion of said recess being open and coinciding with the bottom surface of said projecting portion, the top portion of said recess being in communication with a slot in which is received a resilient cushion provided with an opening for alignment with a corresponding opening in a sealing nut and which further is in communication with said pipe through a delivery pipe portion received in the upper surface of said projecting portion, and camming means on each side of said housing in operative alignment with the lever of said control valve to deliver gas into said recess and with the open bottom portion of said recess to urge a nut into resilient sealing engagement with said cushion to provide a seal around the aligned openings thereof for gas delivery purposes, said camming means being arranged for simultaneous operation.

8. Apparatus for use in gas pressurization and sealing of a refrigerant drier which includes a casing containing desiccant and end caps provided with threaded nipples on which sealing nuts are received for pressure tight sealing engagement with seats formed on the ends of said nipples, said apparatus including a block-like housing detachably mounted on a gas delivery pipe in association along one side thereof with a lever operated control valve mounted in said pipe and controlling gas delivery therefrom, the side of said housing opposite said one side being provided with a projecting rib-like portion the bottom surface of which overhangs said opposite side, a recess in said projecting portion defined by surfaces which conform to the configuration of a sealing nut to rotationally fix the same upon receiving a nut therein, the bottom portion of said recess being open and coinciding with the bottom surface of said projecting portion, the top portion of said recess being in communication with a resilient cushion provided with an opening for alignment with a corresponding opening in a sealing nut and which further is in communication with said pipe through a delivery line portion received in the upper surface of said projecting portion, a rotatable shaft extending transversely through said housing and mounting a lever thereon at the end associated with said one side, a lever operating cam on said shaft and operatively aligned with the lever of said control valve to deliver gas into said recess upon rotation of said shaft, and a nut clamping cam on the opposite end of said shaft associated with said opposite side of said housing below said projecting portion and aligned with the open bottom portion of said recess to urge a nut into resilient sealing engagement with said cushion to provide a seal around the aligned openings thereof for gas delivery purposes, said cams being mounted on said shaft for simultaneous operation.

9. Apparatus for use in gas pressurization and sealing of a refrigerant drier which includes a casing containing desiccant and end caps provided with threaded nipples on which sealing nuts are received for pressure tight sealing engagement with seats formed on the ends of said nipples, said apparatus comprising a block-like housing detachably mounted on a gas delivery pipe in association along one side thereof with a lever operated control valve mounted in said pipe and controlling gas delivery therefrom, the side of said housing opposite said one side being provided with a projecting rib-like portion the bottom surface of which overhangs said opposite side, a recess in said projecting portion defined by surfaces which conform to the configuration of a sealing nut to rotationally fix the same upon receiving a nut therein, the bottom portion of said recess being open and coinciding with the bottom surface of said projecting portion, the top portion of said recess being in communication with a slot in which is received a resilient cushion provided with an opening for alignment for a corresponding opening in a sealing nut and which further is in communication with said pipe through a delivery line portion received in the upper surface of said projecting portion, a rotatable shaft extending transversely through said housing and mounting a lever thereon at the end associated with said one side, a lever operating cam on said shaft and operatively aligned with the lever of said control valve to deliver gas into said recess upon rotation of said shaft, and a nut clamping cam on the opposite end of said shaft associated with said opposite side of said housing below said projecting portion and aligned with the open bottom portion of said recess to urge a nut into resilient sealing engagement with said cushion to provide a seal around the aligned openings thereof for gas delivery purposes, said cams being mounted on said shaft for simultaneous operation.

10. The method of pressurizing an article including in its assembly a threadedly attached end sealing means provided with a gas delivery opening therethrough which is in communication with the interior of said article in a loosened condition and which is sealed from communication with the interior of said article in a tightened condition, said method comprising inserting said sealing means in its loosened condition in an enclosure which prevents rotation of said means therein, clamping the opening of said sealing means in sealed communication with gas delivery means, pressurizing said article with gas, and rotating said article to advance said sealing means into its tightened condition to trap gas in said article prior to withdrawal of said sealing means from said enclosure and out of sealed communication with said gas delivery means.

11. The method of pressurizing an article including in its assembly a threadedly attached end sealing means provided with a gas delivery opening therethrough which is in communication with the interior of said article in a loosened condition and which is sealed from communication with the interior of said article in a tightened condition, said method comprising inserting said sealing means in its loosened condition in an enclosure which prevents rotation of said means therein, clamping the opening of said sealing means in sealed communication with gas delivery means, pressurizing said article with gas, and rotating said article to advance said sealing means into its tightened condition to trap gas in said article prior to withdrawal of said sealing means from said enclosure and while retaining gas delivery communication between said gas delivery means.

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