July 23, 1968 M. E. WEBSTER 3,393,843

SLEEVE BUSHING AND PRESSURE CONTAINER CLOSURE CONNECTION

Original Filed April 16, 1964

FIG. 2.

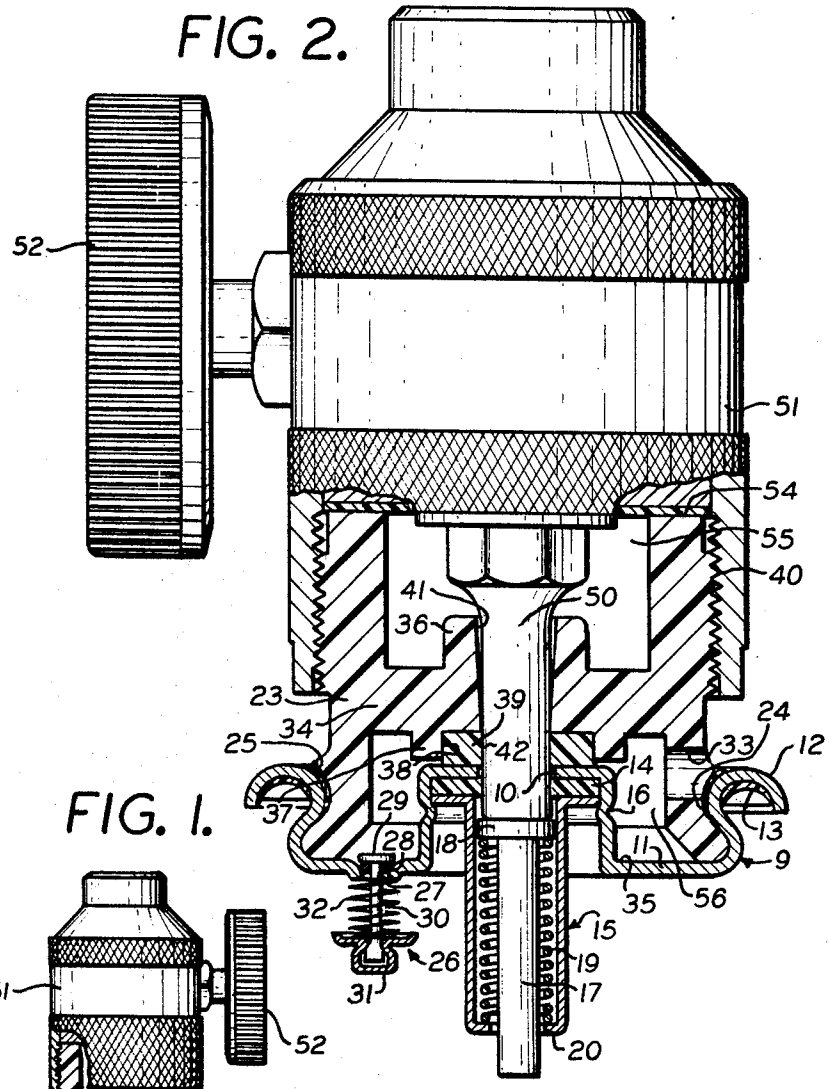


FIG. 1.

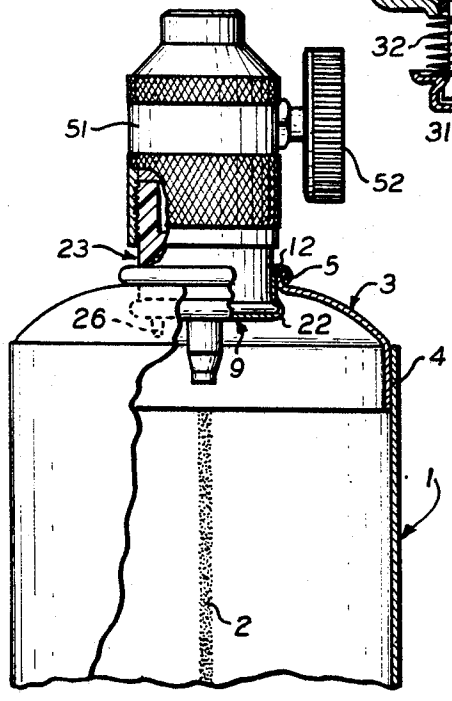
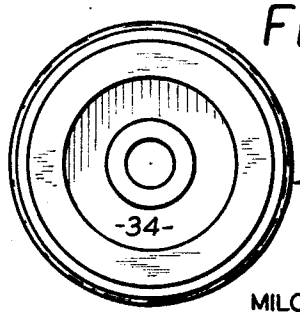


FIG. 3.



INVENTOR
MILO E. WEBSTER
BY

Burgess, Dinklage & Sprung
ATTORNEYS.

United States Patent Office 3,393,843 Patented July 23, 1968

3,393,843

SLEEVE BUSHING AND PRESSURE CONTAINER CLOSURE CONNECTION

Milo E. Webster, Huntington Hills, Rochester, N.Y., assignor to Bernz O Matic Corporation, Rochester, N.Y., a corporation of New York

Continuation of application Ser. No. 360,372, Apr. 16, 1964. This application Aug. 1, 1966, Ser. No. 569,538
6 Claims. (Cl. 222—394)

ABSTRACT OF THE DISCLOSURE

A bushing for the outlet of an LP gas cylinder having a radially extending wall intermediate its ends with an opening for passage of the stem of the tap connector (valve), and pressing a sealing washer into sealing engagement with the cylinder about the cylinder outlet opening.

This application is a continuation of application Ser. No. 360,372, filed Apr. 16, 1964, now abandoned.

This invention relates to an improved pressure container construction. The invention more particularly relates to an improved closure device or tap connection construction for a pressurized fluid container, such as an LP (liquefied petroleum) gas cylinder, as for example of the small portable, throw-away type. Further, the invention provides a sleeve bushing of novel construction, particularly well suited for use in making a closure connection according to the invention.

In recent years, a number of portable appliances which operate off LP gas, and particularly propane, have been widely marketed to the home consumer and various trades. These appliances include, for example, blow torches, lanterns, cook-stoves, grilling devices, fire pots, leak detectors and the like. The commercial success of these items has been predicated upon a convenient, readily available and inexpensive source of LP gas.

Due to its highly inflammable nature the sale and transportation of LP gas is strictly regulated. In the past only relatively large, permanent, refillable cylinders were available for this type of fuel. These cylinders were generally too bulky to be considered truly portable, and their expense and inconvenience in having the same refilled at an authorized station for the most part, precluded their purchase and use by the ordinary amateur handyman and the general public.

Not until the development of the small portable, throw-away cylinder, did the use of portable, propane-operated tools and other appliances, become widespread among the average purchasers. The portable, throw-away LP gas cylinder could be purchased in any ordinary hardware store, could be used interchangeably with various LP appliances, and when the supply of LP gas was exhausted, could be thrown away, avoiding the inconvenience and natural purchaser-resistance to items that had to be returned and/or refilled.

In connection with these cylinders, as with any other throw-away item, cost is of course of prime consideration. This is particularly true with the LP cylinders since regulations require that the same be sturdily constructed of relatively heavy gauge steel and must meet high safety requirements. In spite of these difficulties, modern drawing techniques with the use of automatic punch presses and mass production made successful marketing of these throw-away LP cylinders possible.

The cylinders must have a closure device arrangement which allows the attachment of a tap connection so that the appliance, in connection with which the cylinder is being used, may be attached to withdraw or tap the LP gas. The closure device is generally in the form of a bushing turned from relatively heavy metal stock, as for example on an automatic screw machine, and is provided with a valve arrangement which would automatically seal the cylinder and automatically open upon attaching the tap connection of the appliance in gas-tight manner. Thus, for example, the bushing is provided with a central passage having an O-ring and sealed with an ordinary automobile tire valve, as, for example, is described in U.S. Patent 2,793,504. When the tap connection of the appliance was screwed over the bushing it had a hollow, elongated stem which extended into the tubular passage in sealing engagement with the O-ring, and was so dimensioned that when the tap connection was secured in place, the stem would press against the tire valve, forcing the same open and allowing the contents of the container to be tapped through the tubular hollow stem, to operate the appliance. The closure devices of this type were relatively expensive to fabricate, had to be brazed in place on the cylinder, and greatly increased the cost.

The industry, therefore, constantly strove to develop a closure device construction which would be satisfactory and safe, meet the required regulations in connection therewith, and which yet could be produced more economically and easily than the conventional metal bushings.

One proposal which has proved worthwhile is the subject of my copending application Ser. No. 92,342, filed Feb. 28, 1961, now Patent No. 3,127,072. According to this proposal, a cap having an annular recessed portion is secured in sealing engagement with that portion of the container which surrounds the container opening, with the recessed portion projecting into the container opening. The closure valve is positioned in a discharge passage in the cap, the valve being of a construction described above, and including a valve seat in the form of an O-ring positioned about the discharge opening on the inner side of the cap, and a valve plug secured to a valve stem and mounted for movement into and out of engagement with the valve seat in response to withdrawal or insertion into the discharge passage of the stem of a tap connector. The sleeve bushing is formed of plastic material and is connected to the cap at the base of the bushing, by a pressed fit wherein a portion of the cap material is pressed into a corresponding groove in the base of the bushing. The bushing is threaded to permit the attachment of the tap connector thereto. The proposed connector is characterized in that the sleeve bushing is weaker than is the connection between the sleeve bushing and the cap. Thus, in the event of damage to the container, the sleeve bushing would be broken before damage is inflicted on the cap. In the event of damage to the cap, failure of the cylinder permitting discharge of gas therefrom is likely too ccur. Upon breaking off of the sleeve bushing, however, no such injury would occur, and, further, if a tap connector were mounted on the bushing at the time of infliction of injury, even if the tap connector were torn from the cylinder at the time the bushing is injured, no escape of gas would occur, since the valve would close upon withdrawal of the stem of the connector from the valve discharge passage.

While this proposed connector has been found to offer substantial advantage in that it serves to permit utilization of inexpensive components for the making of connection to the pressurized gas cylinder, it has been found that still further improvement is desirable in order to provide for safer operation, a better seal, and more convenient connection.

It is a principal object of the invention to accommodate the use of a cap and simple inexpensive valve and a simple inexpensive sleeve bushing, for use to effect com-

munication between the gas container and a tap connector.

The manner in which these and other objects are attained, according to the invention, will be apparent from the following description taken in connection with the accompanying drawing, in which:

FIG. 1 is an elevation view, partially in section, of an LP cylinder outfitted with a sleeve bushing according to the invention and having a tap connector mounted thereon;

FIG. 2 is a enlarged view of the cap, sleeve bushing, and tap connector as is shown in FIG. 1, and showing more of these elements in cross-section; and

FIG. 3 is a top plan view of the sleeve bushing.

According to the invention, for a connection to a LP cylinder wherein a cap is disposed in the opening of the cylinder and a sleeve bushing is secured to the cap for connection thereto of a tap connector, the invention provides the improvement of a sealing washer disposed on the outer side of the valve discharge passage, coaxial with the discharge passage, and in sealing engagement with the portion of the cap which defines the discharge passage. The sealing washer is positioned so that its opening is aligned for passage therethrough of the connector stem, and the inside diameter of the washer is such as to provide sliding friction contact with the connector stem. The bushing is formed to provide a seat for the sealing washer and the bushing holds the sealing washer in the engaging relation with the cap. Further, as mentioned above, the tap connectors are mounted on the bushings which in turn are mounted on the LP cylinders, by a threaded connection, and the invention provides improvement in the sleeve bushing which facilitates the making of this threaded connection. Thus, the sleeve bushing includes a lead-in collar disposed coaxially with the discharge passage of the container valve, and further, disposed for receiving the stem of a tap connector in advance of engagement of the threads of the connector and the sleeve bushing. This provides for guiding of the tap connector onto the sleeve bushing in a manner such that cross-threading of the connector on the sleeve bushing, will be prevented.

Desirably, the sleeve bushing is formed with a radially extending wall disposed intermediate the ends of the body thereof. The wall can be integral with the body portion of the sleeve bushing and can include the sealing washer seat, as a recess about an axially extending opening through the wall. Also, the lead-in collar can be formed integrally with the wall as an extension thereof from the side opposite the seat for the sealing washer.

A still further improvement in respect to the construction of the bushing is the positioning of a friction member in the bead and groove connection of the sleeve bushing to the cap. Thus, it is known to secure the sleeve bushing in the cap by pressing a bead formed in the cap, into a groove formed in the bottom portion of the sleeve bushing. Such a connection secures the bushing against axially directed displacement. The bushing is commonly of hard, smooth surface, low friction material, and the cap is commonly formed of metal, so that the possibility of rotation of the sleeve bushing in the cap is present. According to the invention, a friction or gripper member is positioned in the bottom portion of the bushing groove, and this gripper member is formed of high friction material and adheres to the sleeve bushing. Upon the bead of the cap being pressed into the groove, a connection secure against rotational movement of the sleeve bushing, is obtained.

As shown in FIG. 1 of the drawing, **1** represents a cylindrical metal tube which has been formed from a rectangular metal sheet, for example, a rectangular sheet of sheet about 0.023 inch thick, such as by rolling and welding together the overlapping edges to form the welded seam **2**. This welded seam may, for example, be formed with a small overlapping of the edges with a mesh weld. The top of the tube **1** is sealed by the end closure **3**, which may be stamped from sheet metal and has an inner diameter which corresponds to the outer diameter of the tube **1**, so that the same may be positioned in the tube, as shown, and welded, for example, with a lap seam weld at **4**. The end closure **3** has an opening defined by the rolled edge or lip **5**. The bottom of the container (not shown) can be formed in a manner generally similar to that described for the top.

A cap **9** of sheet metal is crimped in sealing engagement with the bead **5** of end closure **3**, and thus, the cap **9** can be secured in the cylinder opening defined by the bead **5**. The construction of the cap **9** can be best seen in FIG. 2. The cap is provided with a central opening **10**, a dished-out portion **11**, and a curled-over edge **12**. The inner surface of the curled edge **12** is provided with a coating of elastic sealing material, such as rubber or the like, at **13**. A washer-shaped gasket of rubber, neoprene or the like, **14**, is fitted on the underside of the surface which forms the discharge passage **10** through the cap **9**. This gasket is secured in place by the valve housing **15**, which, in turn, is secured in place in the cap **9**, by the crimps **16**. A valve stem **17** is positioned in the valve housing **15**, and has a valve plug **18** attached to the upper end thereof. A spring **19** works against the housing **15** and urges the valve plug into engagement with the gasket **14**, which serves as the valve seat. The valve housing **15** is communicated with the inside of the container **1** by means of the radially extending slots **20** in the lower end of the valve housing **15**. The cap **9** is provided with circumferentially extending bead **22**, and the connector **23** has, disposed disposed adjacent its lower end, a circumferentially extending groove **24** for receiving the bead **22** so that the connector **23** is joined to the cap **9** and secured against axial movement in respect to the cap. In order to prevent any rotational movement of the bushing **23** in the cap **9**, an annular ring of a high friction material, such as the ring **25**, can be deposited in the bottom of the groove **24**. Any suitable high friction material can be used to form the ring **25**. A sealing compound can, for example, be used. The use of the ring **25** serves to interpose a material of relatively high friction coefficient between the confronting surfaces of the bushing and the cap, which surfaces are commonly smooth and of low friction coefficient.

The cap **9** is provided with a relief valve **26**. The cap is punched to provide the opening **27**, and an O-ring **28** is placed in this opening. A valve plug **29** on a valve stem **30** works against the O-ring **28** to effect a seal at the opening **27**. An end plate **31** is secured by crimping to the stem **30** and serves as a seat **31** for the spring **32**, which works between the inner surface of the cap and the end piece **31** to urge the plug **29** into sealing engagement with the O-ring **28**. Upon the development of excessive pressure in the cylinder **1**, the relief valve **26** operates to relieve excess pressure. As can be seen in FIG. 2, the sleeve bushing **23** is provided with a radially extending opening **33**, through which gas entering the sleeve bushing from the relief valve **26** can escape.

The sleeve bushing **23**, as can be best seen in FIG. 2, has a radially extending wall **34** which is provided with an opening aligned with the discharge passage **10** of the cap **9**. The radially extending wall **34**, on the side thereof adjacent the lower end **35** of the sleeve bushing is provided with an annular projection **37**, which defines a seat **38**, disposed about the opening **41** in the wall **34**. A sealing washer **39** is received in the seat **38** and is held in sealing engagement with the cap **9**, about the discharge passage **10** in the cap **9**. The sealing washer **39** can be of any suitable washer material, such as rubber. The opening **42** in the washer **39** is of a size for sliding friction contact with the stem of a tap connector as it passes through the discharge passageway to communicate the connector with the inside of the container.

It will be observed that the sealing washer **39** and the valve seat **14** cooperate to provide a sliding friction seal between the valve discharge passage and the stem **50** of the tap connector **51**. Further, it will be observed that the manner in which the sleeve bushing is secured to the cap **9** by the bead and groove connection, groove **24** and bead **22**, serves to urge the sleeve bushing toward the cap, and hence serves to press the sealing washer **39** into tight fitting engagement with, on the one hand, the radial wall **34** and, on the other hand, the portion of the cap **9** surrounding the discharge opening **10**.

A further feature of the bushing of the invention is that a collar **36** extends upwardly from the radially extending wall **34**, about the opening **41**, and serves as a lead-in collar. Thus, the sleeve bushing **23** is provided with the external threads **40** for threading a tap connector **51** onto the bushing, and the collar **36** is proportioned so that it will receive the lower end of the connector stem **50** in advance of engagement of the threads of the tap connector and the sleeve bushing. The lead-in collar then serves to guide the tap connector into proper alignment with the sleeve bushing, so that the threaded joint can be made without cross threading. The opening **41** can be formed with a slight taper, for example, about 3°, so that this opening converges toward the discharge passage **10** through the cap **9**.

The sleeve bushing **23** can be formed of any fairly rigid and strong plastic material, such as polypropylene, high density polyethylene, nylon, or the like.

The bushing can be installed in the cap **9**, as is described above, either before or after the cap **9** is installed in place in the end closure **3** of the container **1**. As shown in FIG. 2, the cap has an upper turned-over portion **12** lined with material **13**, and this turned portion is placed on the bead **5** formed about the opening in the end closure **3**, and the turned portion **12** is then deformed to bend it with the bead **5** to secure the cap in place on the end closure **3** as is shown in FIG. 1. The sleeve bushing can be forced axially with respect to the cap to bring the bead **22** of the cap into seating engagement with the groove **24** of the bushing, when the cap is in the condition indicated in FIG. 2. The cap-sleeve bushing sub-assembly can then be placed in the opening in the end closure **3**, and the cap can then be secured in the enclosure by bending the turned portion **12**, as described above.

A tap connector **51**, which can be a tap connector as is described in U.S. Patent 2,793,504, can be screwed onto the sleeve bushing **23**. The central, elongated hollow stem **50** of the tap connector, passes into the lead-in collar **36** in advance of engagement of the thread, and guides the tap connector threads into accurate engagement with the sleeve bushing threads. Upon threading of the connector onto the sleeve bushing, the stem **50** of the connector passes through the sealing washer **39** and the valve seat **14** and is in sealing engagement therewith. The stem of the connector **51** engages the valve stem **17** and forces the valve stem inwardly, whereby the stem **50** of the connector is brought into communication with the inside of the cylinder **1**. The inwardly disposed end of the stem **50** is provided with an appropriate opening for receiving gas from the inside of the cylinder **1**. The connector is provided with a hand wheel **52**, and a valve arrangement (not shown), for controlling withdrawal of gas from the cylinder.

The connector **51** is threaded onto the sleeve bushing so that the upper end of the sleeve bushing is in sealing engagement with the tap connector. Thus an upper chamber **55** is defined by the tap connector, said walls of the sleeve bushing and the radially extending wall of the sleeve bushing. Further, the cap **9**, said walls of the sleeve bushing and the radially extending walls of the sleeve bushing define a lower chamber **56**. This lower chamber is vented to the atmosphere by opening **33**. Should leakage along the stem **50** occur, pressure would be developed in the upper chamber **55** and would work against the tap connector and the radial wall **34**, so that there would be an equalization and the developed pressure would not tend to blow the sleeve bushing of the cylinder. Since the lower chamber **56** is vented, pressure would not develop therein.

While the invention has been described with respect to particular embodiments thereof, it will be appreciated that these embodiments are merely representative, and do not serve to set forth the limits of the invention.

What is claimed is:

1. In a container for pressurized fluids having a discharge opening, a cap having a peripheral annular recess portion in sealing engagement with the portion of the container surrounding said discharge opening, a discharge passage defined in said cap, a closure valve sealing said discharge passage, said closure valve comprising a valve seat disposed about the inner side of the discharge passage and a valve plug yieldingly urged axially of and toward said discharge passage for sealing engagement with the valve seat, and a sleeve bushing, said sleeve bushing having an open upper end and an open lower end secured to said cap and having axially extending sidewalls and a radially extending wall intermediate its ends, the outwardly disposed end portion of said bushing being threaded, a threaded tap connector threaded onto said cap threads, said tap connector having a connector inlet stem inserted into the discharge passage of said closure valve forcing the valve plug from engagement with the valve seat and communicating the tap connector with the inside of the container, the improvement which comprises means defining a connector stem lead-in collar integral with the radially extending wall of said sleeve bushing and disposed coaxially with said discharge passage and disposed outwardly thereof, said connector stem passing through said lead-in collar, said lead-in collar extending outwardly of the discharge passage for receiving the connector stem in advance of engagement of the threads of the connector and the threads of the sleeve bushing for preventing cross-threading of the connector on the sleeve bushing, the tap connector forming with the sidewalls of the sleeve bushing and the radially extending wall of the sleeve bushing a sealed upper chamber, and the cap, sidewalls of the bushing and the radially extending wall of the bushing forming a lower chamber, and means defining an opening in the sleeve bushing sidewall communicating the lower chamber with the atmosphere.

2. Improvement according to claim **1**, a sealing washer coaxial with said discharge passage disposed on the outer side of said discharge passage in sealing engagement with the portion of said cap defining said discharge passage, said connector stem passing through said washer and being in sliding friction contact therewith, said sleeve bushing comprising a seat in the radially extending wall thereof for the sealing washer and fixedly holding the sealing washer in said sealing relation with said cap.

3. A sleeve bushing comprising a cylindrical body portion having a lower open end and an upper open end, an endless circumferential groove in the body portion adjacent the lower end, a radially extending wall disposed intermediate the ends of the body portion, means defining an axially extending opening in said wall, a recess in said wall about said opening, adjacent said lower end of the bushing, and a sealing washer positioned in said recess.

4. A sleeve bushing according to claim **3**, and including a collar extending from said wall toward said upper end of the sleeve bushing, said sleeve bushing body portion being threaded for threading an attachment on the said upper end of the sleeve bushing.

5. A sleeve bushing according to claim **4**, said sleeve bushing body portion being formed of hard, smooth surface, low friction material, and including a gripper member in the bottom portion of said groove, said gripper member being formed of high friction material and adhering to the sleeve bushing in said groove.

6. In a container for pressurized fluids having a dis-

charge opening, a cap having a peripheral annular recess portion in sealing engagement with the portion of the container surrounding said discharge opening, a discharge passage defined in said cap, a closure valve sealing said discharge passage, said closure valve comprising a valve seat disposed about the inner side of the discharge passage and a valve plug yieldingly urged axially of and toward said discharge passage into sealing engagement with the valve seat, and a sleeve bushing having axially extending sidewalls secured to said cap and for attachment to said container of a tap connector having a connector inlet stem for insertion into the discharge passage of said closure valve to force the valve plug from engagement with the valve seat and communicate the tap connector with the inside of the container, the improvement which comprises a sealing washer coaxial with said discharge passage disposed on the outer side of said discharge passage in sealing engagement with the portion of said cap defining said discharge passage, said sealing washer being positioned for passage therethrough of said connector stem, and being of inside diameter to provide sliding friction contact with the connector stem, said sleeve bushing comprising a seat for the sealing washer and holding the sealing washer in said engaging relation with said cap,

said sleeve bushing comprising a body portion and a radially extending wall disposed intermediate the ends of said body portion, said wall having a bore for passage therethrough of said connector stem, said wall pressing said sealing washer into said sealing engagement with said cap, a tap connector secured to said bushing, the tap connector forming with the sidewalls of the sleeve bushing and the radially extending wall of the sleeve bushing a sealed upper chamber, and the cap, sidewalls of the bushing and the radially extending wall of the bushing forming a lower chamber, and means defining an opening in the sleeve bushing side wall communicating the lower chamber with the atmosphere.

References Cited

UNITED STATES PATENTS

1,637,628	8/1927	Weisgerber	285—27
3,115,283	12/1963	Lindgren	222—394
3,143,253	8/1964	Lindgren et al.	222—396

ROBERT B. REEVES, *Primary Examiner.*

F. R. HANDREN, *Assistant Examiner.*