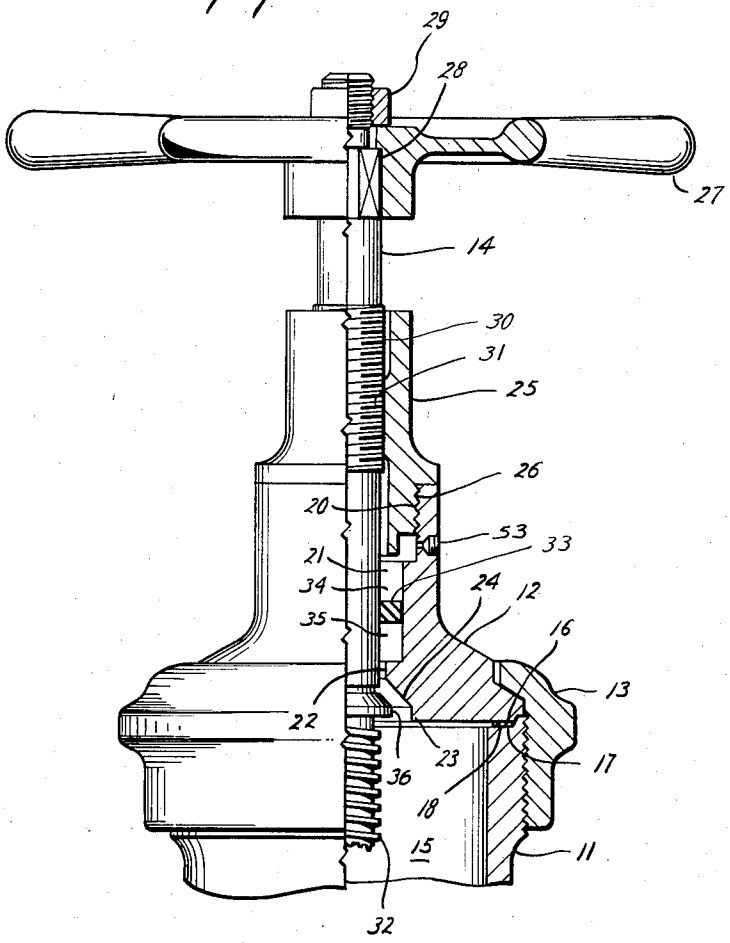
July 8, 1958 C. F. JOHNSON 2,842,336

AUTOMATIC SELF SEALING STEM

Filed Aug. 22, 1955 3 Sheets-Sheet 1

Fig. 1



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BY

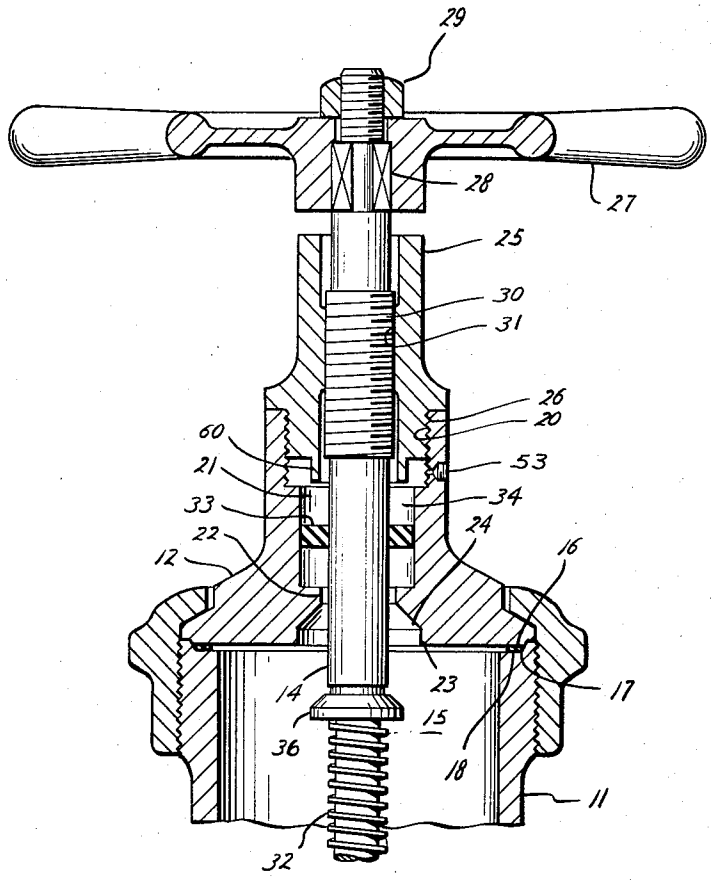
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AUTOMATIC SELF SEALING STEM

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Fig. 2



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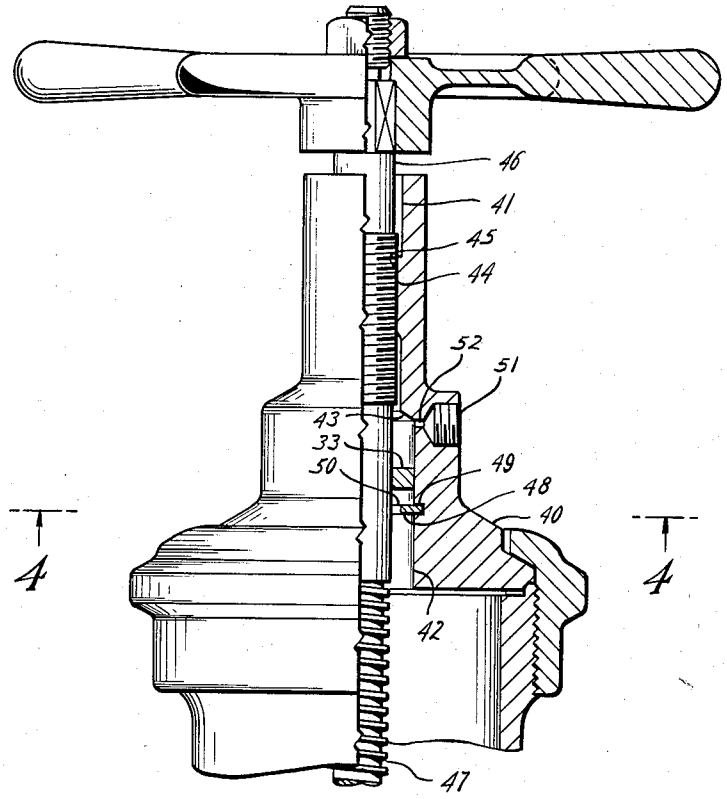
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July 8, 1958 C. F. JOHNSON 2,842,336

AUTOMATIC SELF SEALING STEM

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Fig. 3



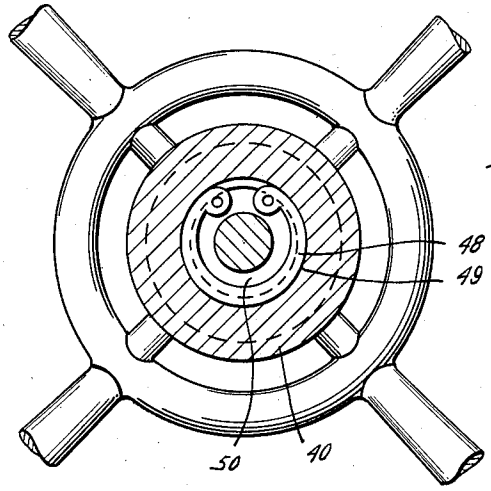


Fig. 4

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United States Patent Office

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AUTOMATIC SELF SEALING STEM

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Application August 22, 1955, Serial No. 529,740

1 Claim. (Cl. 251—330)

This invention pertains to automatic self-sealing stems, in particular to valve stems of valves adapted for high pressure service. The valves in which the invention will most often be used are rising stem gate valves, but the invention will also be useful in other types of valves including non-rising stem types.

One object of this invention is to provide a valve stem which will be automatically self sealing regardless of the pressure within the valve and regardless of the open or closed position of the stem.

Another object of this invention is to provide a stem sealing means which is simple yet effective.

Another object of the invention is to provide a stem and stem sealing means which can safely be dismantled under operating pressure for servicing and the like.

A further object of this invention is to provide a stem having separate closure means adapted to seal the stem when the stem closure is dismantled and the like.

A still further object of this invention is to provide a hydraulic stem sealing means automatic in operation, simple in manufacture, safe, and having interchangeable parts.

Other objects, uses, advantages, and improvements will be apparent from the specification, claim, and drawings, of which:

Figure 1 is a side elevation partly in vertical section of a preferred embodiment of the invention, the valve stem being in a substantially raised position;

Figure 2 is a vertical cross-sectional view of the embodiment of Figure 1, the valve stem being in a substantially lowered position;

Figure 3 is a side elevation partly in vertical section of a modified embodiment of the invention; and

Figure 4 is a horizontal cross-section taken at line 4—4 of Figure 3.

Referring in detail to the drawings in which the same reference numerals refer to the same parts wherever they occur, in Figures 1–2, valve body **11**, bonnet **12**, clamping ring **13**, and stem **14** form a closure for valve chamber **15**. The bonnet closure may be arranged in any suitable way otherwise than as shown. Bonnet **12** has a shoulder **16** which fits into a recess **17** in body **11** and is sealed by resilient means **18** provided between shoulder **16** and recess **17**. Clamping ring **13** overlaps bonnet **12** to hold bonnet **12** against body **11** and is screwed onto body **11** by suitable thread means on the ring and body or otherwise secured thereto. Bonnet **12** has a central longitudinal opening comprising an upper internally threaded portion **20**, a central portion **21**, a reduced annular portion **22**, and an enlarged lower portion **23** having a downwardly diverging conical shaped connecting portion **24** with annular portion **22**. Annular portion **22** has a small clearance with stem **14**, which is received in the longitudinal opening of bonnet **12** and is threadingly received and held in place by a boss **25** which has a lower threaded portion **26** screwed into upper internally threaded portion

20 of bonnet **12**. Hand-wheel **27** is held on an adapted portion **28** of stem **14** by a nut **29**.

Bonnet **12** has an injection port **53** below the threaded portion of upper portion **20**, which is larger than central portion **21** of the longitudinal opening. Port **53** may be threaded to receive sealant injection equipment (not shown) and suitable plug means (not shown).

Stem **14** has an upper threaded portion **30** received in internal threaded portion **31** of boss **25**, a lower threaded portion **32** to engage the valve gate means and an intermediate enlarged annular seat portion **36** which has an upper cone-shaped portion adapted to seat against the conical shaped portion **24** of lower portion **23** of the longitudinal bonnet opening. When stem **14** is rotated by handwheel **27** in a direction to cause upward movement of stem threads **30** in boss threads **31**, the oppositely-pitched threads **32** at the lower end of the stem are screwed into a gate lifting nut means (not shown) so that the valve gate (not shown) will be moved upward at a faster rate than the stem, as will be apparent to those skilled in the art. Similarly, opposite stem rotation to lower the stem will cause the gate assembly to be moved downwardly at a faster rate than the stem.

In the annular space between stem **14** and central portion **21** of the bonnet, a piston means **33** is disposed in sliding and sealing engagement with stem **14** and bonnet **12**. The piston means **33** divides the longitudinal opening of bonnet **12** into upper and lower zones **34** and **35**, respectively. Boss **25** has a lower diminished collar **60** which limits the upward movement of piston means **33**.

Pressure in valve chamber **15** enters zone **35** past annular portion **22** and acts against the lower side of piston means **33**. The pressure in valve chamber **15** will be the same as the line pressure at the high pressure side of the valve gate for most types of gate valves. Sealant injected into zone **34** exerts a pressure against the upper side of piston means **33** and in addition seals about the engagements of piston means **33** with stem **14** and bonnet **12**. The sealant in zone **34** is retained therein by piston means **33** and the closures at threads **20** and **26** and threads **30** and **31**. The pressures in zones **34** and **35** will equalize by movement of piston means **33**, zone **34** being substantially full of sealant so that the piston movement will not be excessive and so that sealant will be in contact with all of the piston and threaded engagements to help seal them. When pressure in chamber **15** and zone **35** is decreased, piston means **33** will move downward somewhat as the sealant in zone **34** expands, but piston means **33** will not ordinarily drop to the bottom of zone **35**.

When chamber **15** and zone **35** are under pressure, and stem **14** is rotated in opening or closing the valve, stem **14** will slide in the center opening in piston means **33**, maintaining the seal. It is apparent that the seal about stem **14** will be maintained even though stem **14** be moved anywhere between the raised and lowered positions, Figures 1 and 2, respectively, since stem **14** will rotate in and slide through the piston means without disturbing the sealing effect of the sealant in zone **34**.

Should it be desired to open the sealing zones **34** and **35** for inspection or for cleaning, stem **14** may be rotated to the fully raised position, threads **26** of boss **25** screwed out of threads **20** of bonnet **12**, thereby bringing the cone-shaped surface of seat **36** into sealing engagement with conical surface **24** and forming a seal between chamber **15** and zone **35**. Once this seal is established, nut **29**, handwheel **27**, boss **25**, and piston means **33** may be removed. The pressure in chamber **15** will hold seat **36** against surface **24** while any of these parts are replaced or repaired.

A second embodiment of the invention is shown in

Figures 3–4 of the drawings. Bonnet **40** has an axial longitudinal opening comprising an upper portion **41** and a lower portion **42**, lower portion **42** being of larger internal diameter than upper portion **41**, there being a cone-shaped portion **43** therebetween. Upper portion **41** has a threaded section **44** adapted to engage a threaded section **45** of a stem **46** which is received by the longitudinal opening of the bonnet. Stem **46** also has a lower threaded portion **47** adapted to enage the valve gate assembly (not shown). Lower portion **42** has a slot **49** adapted to receive a split ring **48** which encircles stem **46** leaving a clearance space **50** between the stem and the split ring. The position of the slot **49** and split ring **48** may be at any point spaced from the top of portion **42** of the longitudinal bonnet opening, leaving sufficient space between split ring **48** and cone-shaped portion **43** for a piston means **33**. At the top of portion **42**, a threaded injection port **51**, having a section of smaller bore **52** at its entry into portion **42**, is provided through the bonnet for injection of a sealant material into portion **42** above piston means **33**. Port **51** is plugged by suitable means (not shown) when sealant is not being injected.

The embodiment of Figures 3–4 operates in the same manner as the embodiment of Figures 1–2 to form a seal around the stem **46**. The sealant fluid above piston means **33** is retained by plug means in port **51**, piston **33**, and threads **44** and **45**. Pressure in valve chamber **15** passes through clearance space **50** between split ring **48** and stem **46** and acts upwardly against piston means **33**. Split ring **48** prevents piston means **33** from dropping out of portion **42** into chamber **15**, and cone-shaped portion **43** limits the upward movement of piston means **33**. There is no means in the embodiment of Figures 3–4 for access to the sealing elements without removing the bonnet. The embodiment of Figures 3–4 does not include a closure means such as is provided by seats **36** and **24** in the preferred embodiment.

While the invention is shown and described in connection with a rising stem gate valve, it can be used in non-rising stem valves as well. The invention may also be used in other types of equipment where it is desired to seal a stem at its passage through a cover or wall of a pressure vessel or a vacuum vessel.

The sealant may be one of the types used in plastic sealed valves or it may be any other relatively high viscosity material. The sealant is usually at least somewhat fluid. The piston means may be any of the conventional types and may have ring seals or any other seals. Since piston means **33** is subjected to equal pressures from both sides, it may be of light construction. All of the sealing elements described may be made to be interchanged, and different elements may be substituted. The arrangement of the elements is subject to considerable modification, as will be obvious to those skilled in the art. For example, seat element **36** may be made flat on top and made to seat against a flat bonnet surface, or a resilient seal may be substituted. Many other modifications are possible, and the scope of the invention is to be limited only as limited by the scope of the following claim.

I claim:

In a valve having a valve body adapted to contain a fluid under pressure, a bonnet closing one end of the body and having an axial bore provided at one end with threads, a rotatable valve stem having threads engaging the bonnet threads for moving the stem axially of said bore, the bore and the stem having spaced peripheries defining an interior chamber of annular cross-section, an annular piston disposed in said interior chamber dividing said chamber into an inner zone, freely communicating with said valve body and any pressured fluid therein, and an outer zone freely communicating with said threads, a body of fluid sealant under pressure in said outer chamber, said piston slidably engaging both said bore and said stem to assume a position in said chamber determined by the relative pressures in said zones and to accommodate rotational and axial displacement of said stem, relative to said bonnet, said bonnet having a valve seat portion surrounding said stem intermediate said bore and the valve body, and an annular valve surface on said valve stem for seating engagement with said valve seat upon axial displacement of said valve stem.

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