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[54] **MULTI-WAY TAP FOR A FILLING MACHINE**

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[58] **Field of Search** 417/437, 519, 313; 137/243.2; 251/274, 180, 206

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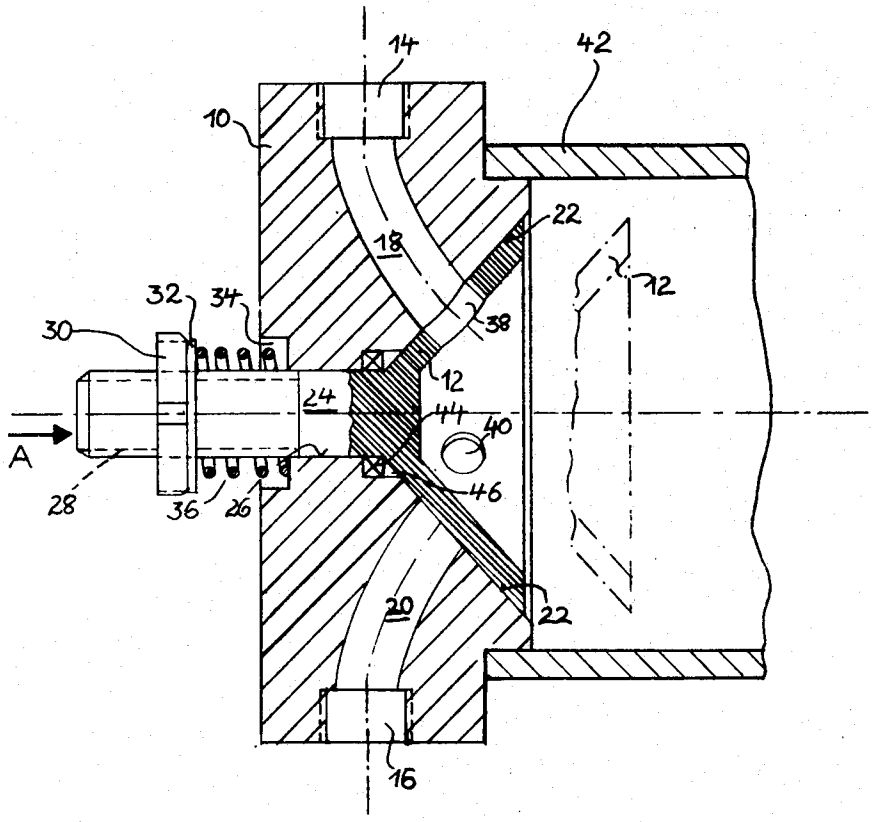
Primary Examiner—William L. Freeh

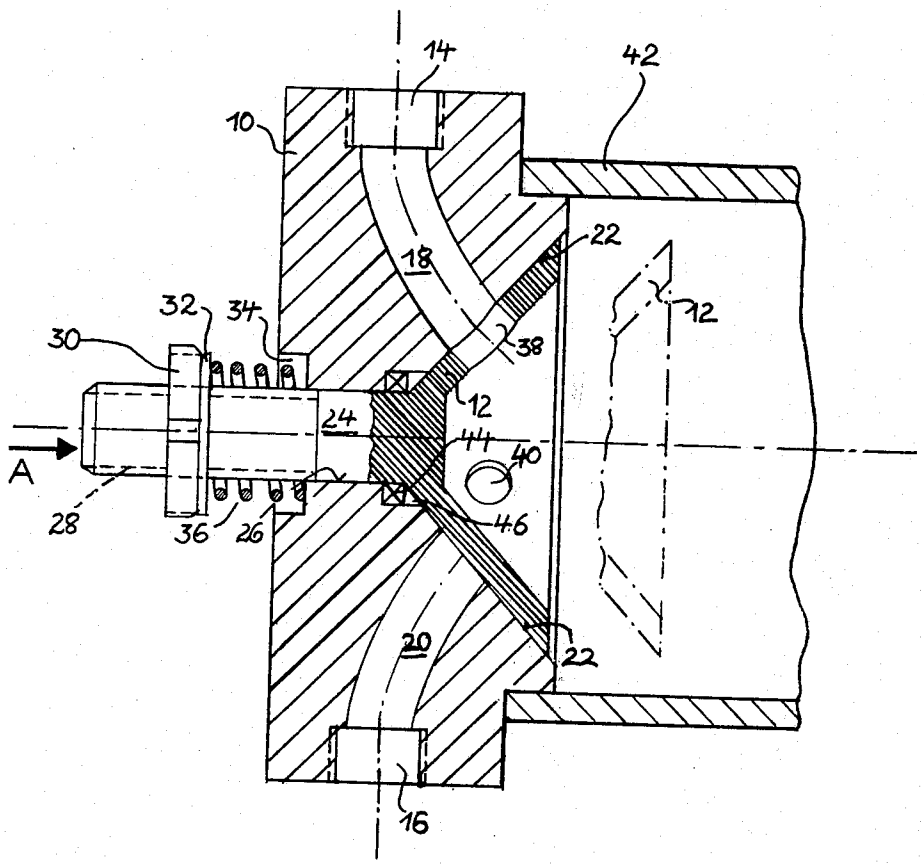
Attorney, Agent, or Firm—Allison C. Collard

[57] **ABSTRACT**

A multi-way tap for a filling machine includes an enclosed casing having external connections and an internal seat surface. A control member is supported in the casing by a stub shaft for rotation about an axis of the seat surface and has a mating surface pressed into engagement with the seat surface by a clamp or clamping mechanism including a spring acting on the stub shaft externally of the casing, whereby the angular position of the control member defines a flow path for a fluid to only one of the external casing connections via ports and passages respectively formed in the casing and the control member. The stub shaft is connected to the control member on the side of the latter which presents the mating surface and a free space of the casing, which space may be the interior of the cylinder of a piston metering pump, the free space being provided in the casing on the side opposite to the mating surface. The spring clamp is releasable so that the control member can be moved away from the seat surface into the free space, during cleansing of the inside of the tap, by displacement of the stub shaft inwardly of the casing.

6 Claims, 1 Drawing Figure




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MULTI-WAY TAP FOR A FILLING MACHINE

This invention relates to a multi-way tap suitable for a machine for filling containers with a flowable material or a fluid.

The invention concerns in particular a tap of the kind which includes an enclosed casing having external connections and presenting an internal seat surface for cooperation with a mating surface of a control member arranged in the casing for rotation about an axis of the seat surface so that the angular position of the control member defines a flow path for a flowable material to one of the casing connections via ports and passages provided in the casing and in the control member, and clamping means for resiliently pressing the mating surface of the control member into engagement with the seat surface of the casing. The clamping means is releasable to enable movement of the control member away from the seat surface into a free space in the casing during a cleansing operation by displacement of a stub shaft which extends into the casing and is connected to the control member.

Multi-way taps are used in filling machines, for example, for alternately connecting a supply of the material to be dispensed to a metering pump and connecting the metering pump to the container which is to be filled. It has been found to be a disadvantage in filling operations calling for sterile filling, for example in packaging liquid or pastiform foodstuffs and pharmaceutical liquids, that cleaning and sterilisation of a multi-way tap or a filling machine necessitate the removal of the tap from the machine, its dismantling and its individual introduction into a cleaning or disinfecting solution. It is also undesirable that the multi-way tap has to be removed and dismantled to enable the residue of previously filled material to be removed when dealing with materials which change frequently but must not be intermixed, for example different paints.

The prior art discloses a filling device for bottle filling machines (German Patent 842,902) having a conical tap plug which is lifted from its seat surface against the force exerted by a spring mechanism and is latched in the raised position during sterilizing of the interior of the filling element by steam being blown therein. After the sterilisation operation, the steam that has been blown in is discharged as waste steam from the ports in the casing which are exposed by the plug being lifted from its seat.

However, this arrangement does not enable the known filling element to be cleaned or sterilised in a closed circuit. Furthermore, liquid cleansing and disinfecting media, the use of which is desirable for the cleaning of filling machines and which are incomparably more effective than steam (see for example German Patent Publications 1,203,147) cannot be used because these media would discharge from the tap and be lost. Moreover, it is not possible reliably to prevent the ingress of germs into the known tap after completion of the sterilising operation before the plug is returned to its working position against the seat surface of the casing.

The prior art also discloses a multi-way tap of the kind described hereinbefore for a filling machine for the sterile filling of containers (U.S. Pat. No. 2,698,120) in which a frusto-conical control member can be moved into a space formed in the enclosed casing to enable sterilising to be carried out by means of steam blown into the tap. The stub shaft of this tap is connected to the control member at the larger diameter end of the member and the shaft is withdrawn from the tap casing against the action of a spring to move the control member away from the seat surface. Steam which is blown into the tap casing will not then be discharged from the multi-way tap but is discharged via the outlet ports in the casing so that it may also be utilised for cleansing other vessels which are connected to the outlet ports.

When the working position of the control member is restored, the stub shaft section, which has been withdrawn from the casing for the cleansing and sterilising operation and has therefore not been treated, returns into the interior of the casing and may possibly carry germs from the external atmosphere into the sterilised interior of the tap. This known tap therefore has a non-sterile bridging phase which may render the entire sterilising process ineffective.

It is the object of the present invention to construct a multi-way tap which is provided with an enclosed casing in such a way that it can be completely cleansed and sterilised without dismantling, that is in the installed state.

Accordingly, the present invention provides a multi-way tap of the kind mentioned hereinbefore in which the shaft is connected to a control member on the side of the latter which presents a mating surface and a free space is provided in a casing on the opposite side of the control member, whereby the latter is movable into the free space on displacement of the stub shaft inwardly of the casing.

Accordingly, when the control member is in the displaced state, all internal surfaces and ports of the multi-way valve can be simultaneously flushed from all sides without the flushing medium being able to discharge outside the connections of the multi-way tap.

In the multi-way tap constructed in this manner, the part of the stub shaft which is pushed into the casing during sterilising is exposed to the treatment medium during such sterilising operation and is therefore also sterilised and cleansed. When the operating position of the control member is restored, the treated stub shaft part moves to the exterior and, where appropriate, entrains sterilising fluid into a seal provided around the shaft so that the seal is also subjected to a sterilising effect. A non-sterile bridging phase is thus reliably avoided.

Since the casing of the multi-way tap is completely closed even during the sterilising operation, it is possible for the treatment to be performed in the desired manner in a closed circulation with liquid treatment media, an optimum effect being achievable with a minimum quantity of cleansing and sterilising liquid because the latter can be pumped through the multi-way tap any desired number of times.

The detachable clamping means, in a preferred embodiment of the invention, is disposed on a portion of the stub shaft external to the casing. Accordingly, the clamping device is easily accessible and need not be cleansed or sterilised as for a clamping means which is disposed in the interior of the tap.

Preferably, the external portion of the stub shaft is provided with screw thread, and the clamping means includes a spring engaged between the casing and a component which is threaded on the external shaft portion. The resilient pressure of the control member upon

the seat thus obtained surface ensures that different thermal expansions of the control member and of the casing are resiliently compensated, for example when dispensing liquids at elevated temperature, so that there will be neither excessive gaps between the seat surface and the mating surface of the control member, nor excessive contact pressure leading to difficult movement of the tap. The contact force can also be easily adjusted by means of the screw-mounted component.

It is suggested by the invention that, the stub shaft is sealed in a bore of the casing by a sealing ring which is inserted in a groove in the casing adjacent the inner end of the casing bore, the sealing ring being preferably constructed of polytetrafluoroethylene. The provision of the sealing ring adjacent the inner end of the casing bore offers the previously mentioned advantage that a portion of the stub shaft which has been treated during the sterilising process passes through the seal when the operating position is restored and thus introduces a small amount of sterilising or cleansing fluid into the seal so that this is also kept clean and sterile.

In order to shorten the pivoting path required for changing over the tap, it is advisable to provide the control member with a plurality of ports which can be aligned with the ports or passage that open onto the seat surface of the casing, the ports in the control member being so arranged that at any given time only one port in the control member is aligned with one port of the casing.

An important advantage of the multi-way tap embodying the invention is that it can be directly mounted on the front end of a piston metering pump of a filling machine, the free space for receiving the control member during the cleansing operation being then constituted by the interior of the cylinder of the piston metering pump. When the multi-way tap, arranged in this manner, is flushed, the interior of the cylinder of the metering pump will also be cleansed and sterilised at the same time.

In order that the invention may be readily understood, an embodiment thereof will now be described in more detail, by way of a preferred example with reference to the accompanying drawing.

The single FIGURE of the drawing is a longitudinal section through a preferred embodiment of the multi-way tap according to the invention.

As shown in the drawing, the multi-way tap comprises two principal parts, namely a casing **10** and a control member **12.** In the illustrated embodiment, the casing **10** is provided with two external connections **14** and **16** communicating with respective inlet passages **18** and **20** of the member **12** which extend to a frusto-conical recess of the casing **10,** the surface of the recess forming an inner frusto-conical seat surface **22.**

The control member **12** is constructed as a hollow truncated cone of complementary shape whose smaller-diameter end merges into a latter. The stub shaft **24** extends through a bore **26** in the casing **10** which bore is located centrally of the recess in the casing **10.** The free end of the stub shaft **24** is provided with screw threads **28** on which a slotted nut **30** or an operating lever, not shown, may be screw-mounted for rotating the control member **12.**

A helical spring **36,** whose prestress can be altered by adjusting the slotted nut on the thread **28,** is disposed between the casing **10,** and a washer **32** situated on the casing side of the slotted nut **30.** One end of the spring **36** is located in a turned recess **34** provided in the casing **10.** When the slotted nut is sufficiently retracted by screwing, it is possible to displace the control member **12** in the direction of the arrow A into the position shown in dash-dot lines.

The hollow frusto-conical part of the control member **12** is provided with two movable ports **38** and **40** which may be brought into alignment with one or the other of the casing passages **18** and **20** by appropriate rotation of the control member. The drawing reveals that the ports **38** and **40** are disposed in the wall of the control member in such a way that only one of the connections **14** and **16** of the casing **10** can be brought into communication with the hollow interior of the control member **12** at any time.

The multi-way tap of the illustrated embodiment can be mounted directly on a cylinder **42** of a piston metering pump, only the outermost end of the cylinder being shown. The casing of the illustrated tap is therefore not closed on the cylinder-connecting side. The recess which is open towards the cylinder **42** and forms the seat surface **22** may therefore be regarded as a third connection of the multi-way tap.

To prevent liquid being discharged due to the clearance between the stub shaft **24** and the casing bore **26,** the casing **10** is provided with a sealing ring **44** which is disposed in a corresponding groove **46.** The sealing ring, preferably made of polytetrafluoroethylene, bears on the smooth internal part of the stub shaft **24.**

It will be seen that the smooth part of the stub shaft extends sufficiently into the smooth part of the stub shaft **24** extends sufficiently into the casing bore to ensure that the sealing ring **46** cannot be damaged by the thread **28** of the stub shaft when the control member **12** is displaced into the position indicated by dash-dot lines.

It is advisable to make the external diameter of the screw-threaded part of the shaft **24** of smaller diameter than the external diameter of the smooth part of the stub shaft so that the sealing ring seal **44** cannot be damaged by the screw-threading **28** even if the shaft stub is pushed through completely.

For other applications it is possible for the casing to be extended on the base side of the truncated cone and to be covered, for example by means of a casing cover providing a further connection. In order to retain the inventive advantage of thorough cleansing of all interior surface of the tap, without the need for dismantling, solely by simple flushing through, it is merely necessary to ensure that sufficient free space remains within the closed housing for displacing the control member.

The control member need not be constructed in a solid or hollow frusto-conical form in order to obtain the advantages of the invention and, in a limiting case, it may be constructed as a flat disc forming a rotary valve.

What is claimed is:

1. A multi-way tap for a fluid filling machine, comprising in combination: an enclosed hollow casing including external inlet port connections and having an internal seat surface; a control member disposed in said casing and having a mating surface complementary to said seat surface; a stub shaft extending into said casing and being connected to said control member to mount the same for rotation about an axis common with that

of said seat surface; said control member being formed with a plurality of inlet ports; respective passages being disposed in said casing which lead from said external port connections toward said seat surface and the location of at least one of said inlet ports; the angular position and spacing of said inlet ports defining a sole flow path at any given time for a fluid through only one of said external port connections via one of said passages and one of said inlet ports; and clamping means operatively coupled to said control member for resiliently urging said mating surface into engagement with said seat surface; said casing having a free space formed adjacent said seat surface, and said clamping means being releasable to enable movement of said control member into said free space during a cleansing operation of the tap by displacement of said stub shaft between a normal and an inwardly displaced position; said stub shaft being connected to said control member on the side of the latter which defines said mating surface, and said casing being formed with said free space on the side of said control member opposite to said mating surface; said casing having a bore that receives said stub shaft, said bore including an annular groove adjacent the inner end thereof, and a sealing ring disposed in said groove to seal said stub shaft against said bore so that a fluid-tight seal is provided between said stub shaft and said sealing ring, both in a normal operating position of said control member and in the displaced position of said stub shaft, in order to enable the cleansing operation of the tap internally, in closed circulation with liquid treating media, whereby inadvertent leaking out of the media is prevented during the cleansing operation.

2. The tap as defined in claim **1,** wherein said seat surface and said mating surface are complementary frusto-conical surfaces, said control member being rotatable about the axis of the truncated cone, said stub shaft being connected to said control member at the smaller-diameter end of said mating surface, and said free space being formed beyond the larger-diameter end of said seat surface.

3. The tap as defined in claim **2,** wherein said control member is in the form of a hollow frusto-conical body which is open at its larger-diameter end.

4. The tap as defined in claim **2,** further comprising a piston metering pump having a cylinder and a metering piston movable in said cylinder, which latter is constituted by said free space, the tap forming a closure for the front end of said cylinder, and said free space receiving said control member during the cleansing operation.

5. The tap as defined in claim **2,** wherein said stub shaft includes a shaft portion external to said casing, and said clamping means is disposed on said external shaft portion.

6. The tap as defined in claim **5,** wherein said external shaft portion has thereon a screw thread, and wherein said clamping means includes a component threaded on said external shaft portion, and a spring engaged between said component and said casing.

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