CONVENTION OR NON-CONVENTION APPLICATION FOR A
PATENT OR PATENT OF ADDITION

54905/80

I/We (a) SAUNDERS VALVE COMPANY LIMITED

I/We request that the patent may be granted as a patent of addition to
the patent applied for on application No. (i) ___________ in the name of

No. (g) 7902510....in (h) Great Britain....on (i) ___________ 1979

No. (g) ___________ in (h) ___________ on (i) ___________

My/Our address for service is care of CLEMENT HACK & CO., Patent Attorneys, 140 William Street, Melbourne, Victoria, 3000, Australia.

(j) Dated this 23RD day of JANUARY 1980

(k) SAUNDERS VALVE COMPANY LIMITED

To: The Commissioner of Patents

CLEMENT HACK & CO., Patent Attorneys, 140 William Street, Melbourne Victoria, 3000 Australia
COMMONWEALTH OF AUSTRALIA

DECLARATION IN SUPPORT OF A CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

In support of the application No. (a) made by (b) SAUNDERS VALVE COMPANY LIMITED for a patent/patent-of-addition for an invention entitled (c) DIAPHRAGM VALVES

I. (d) Christopher Need Hayes

of (e) Cwmbran, Gwent NP4 3XX, Wales

do solemnly and sincerely declare as follows:

1. (f) I am/we are the applicant(s) for the patent/patent of addition.

2. The basic application(s) as defined by Section 141 of the Act was/were made in the following country or countries on the following date(s) by the following applicant(s) namely:

   in (i) Great Britain on (j) 24th January 1979 by (k) SAUNDERS VALVE COMPANY LIMITED

3. (l) I/are the actual inventor(s) of the invention.

   of (m) 74 Beaumaris Drive, Llanyravon, Cwmbran, Gwent, Wales

is/are the actual inventor(s) of the invention and the facts upon which the applicant(s) is/are entitled to make the application are as follows:

—as regards entitlement under Section 34 of the Act:—(o) The said SAUNDERS VALVE COMPANY LIMITED is the assignee of the said Glyn Cocking

—as regards entitlement under Part XVI of the Act:—(q)

4. The basic application(s) referred to in paragraph 2 of this Declaration was/were the first application(s) made in a Convention country in respect of the invention the subject of the application.

Declared at Cwmbran this 18th day of December 1979

To: The Commissioner of Patents, Commonwealth of Australia.
A diaphragm valve comprising: a valve body defining a valve seat; a closure diaphragm secured to the valve body; and a compressor coupled to the diaphragm to move the diaphragm into engagement with the valve seat to close the valve to fluid flow and away from the valve seat to open the valve to fluid flow, the compressor being able to couple to a bayonet fitting provided on a faced diaphragm and to a stud extending from a rubber diaphragm, which bayonet fittings and studs are able to couple to respective prior art compressors each of which cannot couple to both the bayonet fitting and the stud.
The following statement is a full description of this invention, including the best method of performing it known to me/us...
This invention relates to fluid flow control valves, and more particularly to diaphragm valves. A diaphragm valve comprises a flexible diaphragm which in use is pressed into engagement with a seat by a compressor to stop fluid flow through the valve. The diaphragm is coupled to the compressor by a coupling device so that when the compressor is moved away from the seat to open the valve to fluid flow, the diaphragm is positively moved away from the seat. If the diaphragm is of rubber, possibly with fabric reinforcement, the coupling device must simply be capable of pulling the body of the diaphragm away from the seat. If the diaphragm is a PTFE faced diaphragm, the coupling is designed to provide some lost motion between the compressor and the facing and may, for example, comprise a bayonet stud as shown in British Patent Specification 901,185. In the past, each type of coupling device was intended to mate only with a particular type of complementary compressor, and it was not possible to use a diaphragm having one type of coupling device with a compressor intended for another type of coupling device. The arrangement has the disadvantage that if it is desired to replace a PTFE faced diaphragm with a rubber diaphragm or vice versa in a particular valve it is necessary to fit the valve with a new compressor compatible with the new type of diaphragm.
Also, because each compressor is unique to the diaphragm type with which it is to be used, the valve manufacturer must make several different types of compressor to mate with different types of diaphragm. This adds to the cost of manufacture.

According to the present invention there is provided a diaphragm valve comprising: a valve body defining a valve seat; a closure diaphragm secured to the valve body; and a compressor coupled to the diaphragm to move the diaphragm into engagement with the valve seat to close the valve to fluid flow and away from the valve seat to open the valve to fluid flow, the compressor being able to couple to a bayonet fitting provided on a faced diaphragm and to a stud extending from a rubber diaphragm, which bayonet fittings and studs are able to couple to respective prior art compressors each of which cannot couple to both the bayonet fitting and the stud.

It is to be understood that the term "rubber diaphragm" as used herein means any flexible elastomeric diaphragm of generally uniform composition used in a diaphragm valve regardless of whether it is made of natural rubber, synthetic rubber, or plastics material, and whether or not it is provided with reinforcing materials. A "faced diaphragm" is any diaphragm used in a diaphragm valve which comprises a body part and a facing part of different material from the body part. The facing part is commonly of Polytetrafluoroethylene (PTFE) but can be of any suitable material.

The invention permits considerable flexibility of diaphragm/compressor combinations. If, for example, an embodiment of valve according to the invention is supplied by the manufacturer fitted with a PTFE faced diaphragm having a bayonet coupling device, this diaphragm may be replaced by a prior art type rubber diaphragm without changing or modifying the compressor of the valve.
The prior art diaphragm will still, of course, fit a standard screw-threaded prior art compressor. Further, stocks of rubber diaphragms and PTFE faced diaphragms held to service valves according to the invention can be used to service existing prior art valves having compressors designed only to mate with rubber diaphragms or PTFE faced diaphragms. The invention means that the manufacturer producing new valves need only make one type of compressor for use with both types of diaphragm, and that the diaphragms stocked as spare parts for this new compressor are usable with existing valves.

The invention will be better understood from the following description of preferred embodiments thereof, given by way of example only, reference being had to the accompanying drawings, wherein:

FIGURES 1 and 2 show partly in section respectively portions of prior art rubber and PTFE faced diaphragms, and their associated prior art compressors;

FIGURES 3 and 4 show respectively a vertical sectional view and a bottom plan view of an embodiment of diaphragm valve compressor according to the invention;

FIGURE 5 shows a portion of a PTFE faced diaphragm for use with the compressor of Figures 3 and 4;

FIGURE 6 is a perspective view, partially cut away, of a second embodiment of diaphragm valve compressor according to the invention;

FIGURE 7 is a perspective view of a PTFE faced diaphragm and adaptor for use with the compressor of Figure 6;

FIGURE 8 is a plan view, on a reduced scale, of a rubber diaphragm for use with the compressor of Figure 6; and

FIGURE 9 is an elevational view of the diaphragm of Figure 8.
Referring to Figure 1 there is shown the central portion of a prior art diaphragm 1 having a body 2 formed of fabric reinforced rubber and a screw-threaded coupling stud 3. The stud 3 includes a threaded upper portion 4 and a head 5. The head 5 is moulded into the body to secure the stud to the body, and the threaded portion 4 extends clear of the body for screw-threaded engagement with a threaded axial bore 6 formed in compressor 7. When the stud 3 is fully screwed home in the axial bore 6 a boss 8 on the diaphragm body is received within a mating recess 9 in the compressor.

Referring now to Figure 2 there is shown a diaphragm 10 comprising a body 11 including a rubber backing portion 12 and a PTFE facing portion 13. A stud 14 includes a head 15 which is moulded within the PTFE of the facing portion 13 and a shaft portion 16 which extends from the head 15 through the rubber backing 12 and outwardly of the diaphragm. The free end of the shaft portion 16 carries a cross-pin 17 which forms a bayonet coupling with compressor 18. The compressor 18 includes an axial bore 19 sized to receive the shaft portion 16 and an enlarged counterbore 20 sized to receive the cross-pin 17. The axial bore 19 is provided with a pair of axially extending slots (not shown) through which the ends of the cross-pin 17 can pass. Thus, to couple the diaphragm 10 to the compressor 18 the cross-pin 17 is aligned with the axially extending slots in the bore 19 and the shaft portion 16 of the stud 14 is pushed through the bore 19 until the cross-pin is located within the counterbore 20. The compressor 18 and diaphragm 10 are then rotated relative to each other through 90° in order to bring the cross-pin 17 out of register with the axially extending slots in the bore 19, and thus to prevent separation of the diaphragm from the compressor. This bayonet coupling provides the desirable lost motion between the diaphragm
10 and the compressor 18, as is well understood in the art.

A comparison of Figures 1 and 2 clearly shows that the diaphragm 1 cannot be coupled to the compressor 18, and the diaphragm 10 cannot be coupled to the compressor 7. Thus, if it is desired to change a particular valve from a rubber diaphragm to a PTFE faced diaphragm, it is necessary to substitute not only a new diaphragm, but also a new compressor compatible with the new diaphragm.

Referring now to Figures 3 and 4 there is shown a compressor 20 having a modified coupling arrangement comprising a threaded bore 21 provided with an enlarged counterbore 22 and a pair of axially extending slots 23. The screw-thread of the bore 21 is identical to the thread of the bore 6 of the prior art compressor 7 shown in Figure 1. Thus, a standard prior art rubber diaphragm as shown in Figure 1 can be coupled to the compressor 20 in exactly the same manner as that described above with reference to Figure 1.

Referring now to Figure 5, there is shown a modified PTFE faced diaphragm 24 which is identical to the prior art diaphragm 10 shown in Figure 2 save for the fact that the diameter of the shaft portion 25 of the stud 26 of the diaphragm of Figure 5 has been reduced as compared with the diameter of the shaft portion 16 of the stud 14 of Figure 2. The diameter of the shaft portion 25 is slightly less than the minor diameter of the threads of bore 21 so that the shaft portion 25 is a sliding fit in the bore 21 to permit bayonet coupling between the diaphragm 24 and the compressor 20. Thus, the compressor 20 can accept standard prior art rubber diaphragms and the modified PTFE faced diaphragms illustrated in Figure 5. New valves provided with a compressor as shown in Figures 3 and 4 can thus be fitted optionally with either rubber
diaphragms or PTFE faced diaphragms, and if in service it is desired to change from rubber to PTFE faced diaphragms this can be done without modification to the compressor. Further, because the compressor 20 will accept standard prior art rubber diaphragms, a stock of rubber diaphragms held to service new valves fitted with the compressors 20 can be used to service existing valves with compressors as shown in Figure 1. Finally, because the length of the cross-pin 17A of the diaphragm 24 of Figure 5 is the same as the length of the cross-pin 17 of the diaphragm 10 of Figure 2, a stock of PTFE faced diaphragms held to service new valves fitted with the compressor 20 can be used to service existing valves with compressors as shown in Figure 2.

Referring now to Figure 6 a portion of a second embodiment of the invention is shown. The compressor 41 shown in Figure 6 is an integral cast metal member having an axially extending opening 42 for receiving a coupling device to couple a diaphragm to the compressor. In use, the compressor is housed within the bonnet of the diaphragm valve and is movable axially by a suitable operating mechanism, as is well known in the art. In order to prevent rotation of the compressor 41 relative to the bonnet and therefore body of the valve the compressor is provided with diametrically opposed projections 43 which engage corresponding grooves in the bonnet.

The opening 42 has a mouth 42A and is formed with screw-threads 44 over a portion of its length adjacent the mouth 42A. Beyond the screw-threaded portion the diameter of the opening increases at a shoulder 45 to form an enlarged portion 46 of the opening.

In use the compressor 41 can be coupled to the conventional prior art PTFE faced diaphragm 10A shown in Figure 7 or to the fabric reinforced rubber diaphragm 48 shown in Figures 8 and 9.
The PTFE faced diaphragm 10A is substantially the same as the diaphragm 10 shown in Figure 2, although its shape is slightly different due to the fact that it is intended for a smaller size of valve. In order to connect the diaphragm 10A to the compressor 41 an adaptor 51 is fitted to the stud 14. The adaptor 51 includes a threaded portion 52 for mating with the screw threads 44 of the compressor and includes a groove 53 in which the stud 14 is received. When the adaptor 51 is correctly mounted on the stud 49 shoulders 54 of the adaptor are gently urged against the bayonet pin 17 by the resilience of the rubber backing of the diaphragm 10A. The adaptor and diaphragm assembly is then secured to the compressor 41 by screwing the adaptor into the threaded portion of the opening 42 until the end 55 of an upstanding projection 56 on the adaptor engages the end wall of the opening 42. In this configuration a lost motion connection is formed between the diaphragm and the compressor in that during closure of the valve the rubber backing of the diaphragm can be compressed to lift the bayonet pin 17 off the shoulders 54, thereby avoiding placing undesirable stresses on the PTFE facing of the diaphragm.

The diaphragm 48 shown in Figures 8 and 9 is of fabric reinforced resilient rubber and includes a button type coupling member 58. This member 58 comprises a head 60 and a necked portion 61 having a smaller diameter than the head 60. Such diaphragms are already known and have previously been secured to compressors intended for use only with this type of diaphragm.

In order to secure diaphragm 48 to the compressor 41 a suitable lubricant (if desired) is applied to the coupling member 58 and the coupling member 58 is pushed into the opening 42 in the compressor. The head 60 of the coupling member 58 is compressed as it passes through the threaded portion of the opening 42, and expands into
the enlarged portion 46. Thereafter, the shoulder 62 formed at the juncture of the head 60 and the necked portion 61 of the coupling member 58 seats on the corresponding shoulder 45 of the compressor to prevent removal of the head 60 from the enlarged portion 46 of the opening 42.

It will be seen then that the compressor 41 is capable of mating with existing PTFE faced diaphragms (by use of the adaptor 51) and with existing rubber diaphragms having button type coupling members. Accordingly, the need for separate compressors for connection with the two types of diaphragm is obviated, and the cost of manufacture of valves and the cost and complexity of spare part storage is significantly reduced. Further, stocks of spare parts held to service existing valves can be used to service new valves having the new type of compressor, and vice versa.
THE CLAIMS DEFINING THE INVENTION ARE AS follows:

1. A diaphragm valve comprising: a valve body defining a valve seat; a closure diaphragm secured to the valve body; and a compressor coupled to the diaphragm to move the diaphragm into engagement with the valve seat to close the valve to fluid flow and away from the valve seat to open the valve to fluid flow, the compressor being able to couple to a bayonet fitting provided on a faced diaphragm and to a stud extending from a rubber diaphragm, which bayonet fittings and studs are able to couple to respective prior art compressors each of which cannot couple to both the bayonet fitting and the stud.

2. A diaphragm valve according to claim 1 wherein the compressor is provided with a threaded axial bore which can threadingly engage a threaded stud extending from a rubber diaphragm.

3. A diaphragm valve according to claim 2 wherein the threaded bore is provided with diametrically opposed slots extending to a counterbore whereby a bayonet fitting comprising a shaft and a cross-pin is secured to the compressor by aligning the cross-pin with the slots, pushing the shaft into the threaded bore until the cross-pin lies in the counterbore, and rotating the bayonet fitting 90° relative to the compressor.

4. A diaphragm valve according to claim 3 wherein the shaft is a close sliding fit in the axial bore.

5. A diaphragm valve according to claim 1 wherein the compressor includes an opening having a mouth adjacent the diaphragm, a screw-threaded portion adjacent the mouth and a relatively large diameter portion on the side of
the screw-threaded portion remote from the mouth, whereby a rubber diaphragm having an integral moulded necked stud can be secured to the compressor by forcing the stud into the opening until the head of the stud is located in the relatively large diameter portion and the neck of the stud is located in the screw-threaded portion.

6. A diaphragm valve according to claim 5 wherein a bayonet fitting is secured to the compressor by means of an adaptor member which forms a lost motion coupling with the bayonet fitting and which is screwed into the screw-threads of the screw-threaded portion.

7. A diaphragm valve according to claim 6 wherein the opening is blind and the adaptor includes a portion which engages the blind end of the opening to limit the amount by which the adaptor can be screwed into the opening.

8. A diaphragm valve, substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

DATED THIS 23RD DAY OF JANUARY, 1980
SAUNDERS VALVE COMPANY LIMITED
By Its Patent Attorneys
CLEMENT HACK & CO.
Fellows Institute of Patent Attorneys of Australia
Fig. 1.
(PRIOR ART)

Fig. 2.
(PRIOR ART)