COMMISSIONER'S DECISION

OBVIOUSNESS: Fuel Tank Check

A check valve utilizing a spring-biased annular diaphragm element to bias the diaphragm against the valve seat is shown in the prior art. A dual function form which permits reverse flow above a predetermined pressure is allowable.

Rejection: Modified.

This decision deals with a request for review by the Commissioner of Patents of the Examiner's Final Action dated November 12, 1974, on application 164,955 (Class 137-60). The application was filed on March 1, 1973, in the name of William L. Sheppard, and is entitled "Fluid Valves."

This application relates to a fuel tank check valve for use in emission control systems of automobile engines. It utilizes a spring-biased annular diaphragm element and is designed to prevent the venting of gasoline fumes to the atmosphere. Two embodiments are disclosed, one utilizing a single function form, the other a dual function form which combines the check valve with a pressure relief movement. The valve opens when pressure builds up to a particular pressure in the gas tank, but remains tightly closed below that point.

In the Final Action the examiner rejected claims 1 to 3 and 21 to 34 for failing to define patentable subject matter over a cited reference, and claims 4 to 18 for not being set forth in distinct and explicit terms. The reference was U.S. Patent 3,073,339 January 15, 1963, Stelzer. In that action the examiner stated (in part):

> The Stelzer patent discloses a control valve comprising a housing having a passageway therethrough, a valve seat in the said passageway, a resilient annular diaphram having a central opening therethrough, an enlarged bead portion

about the outer perimeter of the said diaphram, a zone of increased thickness in the area of the central opening, and an intermediate portion of the said diaphram between the said bead portion and the zone of increased thickness being relatively thin and flexible; the said diaphram seats on the said valve seat at the said zone of increased thickness, and a spring means biases the said diaphram against the said valve seat.

In view of the above discussion, claims 1 to 3, 11, 12, 21, 22, 24 and 34 are refused because they fail to define a patentable improvement thereover.

Claims 13 and 25 to 33 differ from the device disclosed by the Stelzer patent, in that these claims utilize a flat spring to bias the diaphram to the valve closed position, whereas, the Stelzer patent utilizes a helical spring. Flat springs however are well known, and it is held that a replacement of the helical spring by a flat spring, is a mere substitution of an equivalent, and hence not considered to be of patentable significance. An example of flat springs of various shapes may be seen in Canadian patents 543,678 to Maurer et al, and 502,961 to Stilwell Jr., and also in United States patents 3,302,662 to Webb, and 2,901,212 to Winet.

In view of the preceding discussion claims 13 and 25 to 33 are held to be obvious to one skilled in the art, in view of the teaching of the cited patent, and the state of the art of springs, hence the said claims are refused because they fail to define a patentable improvement thereover.

Claim 4 contradicts what has been claimed in claim 1, upon which claim 4 is dependent.

In claim 1, the diaphram is biased into sealing engagement with a valve seat; considering for example, Figure 5; the diaphram is numbers 30, 32, 34, 36 and the seat is number 76.

In claim 4, a movable valve element is biased into sealing engagement with the valve seat, and, the diaphram in turn is biased into sealing engagement with the valve element; the valve element is number 72, and the valve seat here is number 70.

From the above comparison of claims 1 and 4, it is obvious that the seat in claim 1 is not the seat referred to in claim 4, hence the matter in claim 4 contradicts what has already been established in claim 1; claim 4 is dependent upon claim 1.

Claims 5 to 18, being dependent upon claim 4, do not overcome or clarify the above noted contradiction of claim 4 to claim 1.

In view of the above discussion, claims 4 to 18 are refused because the said claims are not set forth in distinct and explicit terms.

...

The relative size of the thin portion between the bead portion at the outer perimeter of a diaphram and the zone of increased thickness in the inner area of the said diaphram, is a matter of selection for one in the art, and therefore is not considered to be of patentable significance.

> One in the art would decide the size of the said thin portion depending upon requirements of such matter as flexibility, the area to be encompassed etc; all such factors would be taken into consideration in deciding the size and thickness of the said thin portion.
>
> It should be noted that the diaphram in the Stelzer patent performs a similar task, in a similar way to the diaphram in applicant's device; the fact that applicant's device, as claimed, emphasizes the entire area between the bead and the zone of increased thickness is not considered to be of patentable significance; such area is a matter of selection for one in the art, and selected to suit a condition.

In the response dated February 10, 1975 to the Final Action the applicant made the following submission (in part):

> Applicant also does not agree with the Examiner regarding the previous arguments on Stelzer. The thick rib 31 which Stelzer deliberately provides between the inner and outer portions is not only a different construction than that claimed, but would have a different function. In particular the rib "renders the radially inner portion of the valve element 18 comparatively stiff" (column 2, lines 39 and 40). The Stelzer diaphragm would be incapable of responding to very small pressure differentials which occur in such applications as automotive gas tanks.
>
> For the Examiner to say that this difference is "a matter of selection for one skilled in the art" is to ignore the express purpose of the Stelzer check valve. Admittedly, mere selection of the particular thickness of a diaphragm in an intermediate diaphragm portion which is of uniform thickness and relatively thin and flexible might be but a matter of choice. However, in this case it is not merely a matter of chosing the exact thickness. It is a question of completely reshaping the Stelzer diaphragm from one which has a high rib 31 several times the thickness of the relatively thin portion 33 to one in which the rib 33 completely disappears. This is not a matter of degree but a matter of kind. Such a change, it is submitted would not be obvious to a person skilled in this art.
>
> To further emphasize this point, claim 1 has been further amended to recite that the entire intermediate portion of the diaphragm is not only thin and flexible but is of uniform thickness throughout.
>
> The remaining claims rejected as failing to define a patentable improvement over the cited reference are believed to define the invention in clear and explicit terms such that the combination defined thereby is different from the Stelzer device. For example, claim 12, now claim 8, is further patentable over Stelzer in that it specifically recites the circular cross-sectional shape of the diaphragm which engages the valve seat. This is completely different than the sharp lip of Stelzer and further emphasizes the wear advantage of our construction.

> Claim 13, now claim 9, is additionally patentable over Stelzer in that it recites the relatively flat washer-type spring, neither shown nor suggested by Stelzer. Although flat springs themselves may not be new, none of the cited references show a combination of this type of spring with the diaphragm as claimed. There are unobvious advantages to this combination, which is more specifically recited in claim 19. The flat spring occupies much less space in an axial direction, contributing to compactness of the assembly. Additionally, previous claims 21, 22, 24 and 34 (now claims 14, 15, 17 and 27) extensively define the invention and further remove it from the teachings of Stelzer.

The Stelzer citation relates to check valves in which the valve element is formed of resilient material. This resilient material is in the configuration of an annular diaphragm having an enlarged integral bead portion at its central opening passage. Spring means are used to bias the central portion of the diaphragm into sealing engagement with a valve seat. Claim 1 of that patent reads:

> A check valve structure comprising a housing having an annular flange provided with a chamber therein and an outlet nipple communicating with such chamber, said flange having an annular free edge portion engageable against an apertured wall of a receptacle and provided with an annular channel, a resilient valve element provided with a peripheral bead shaped to fit in said channel and having a surface substantially flush with said free edge portion of said flange and engageable against the wall of the receptacle to form a seal between said flange and said wall, said valve element having an axial opening therethrough and being formed at one side surrounding such opening with an integral annular thin-edged lip engageable against the wall of the receptacle, the apertures in such wall being radially outwardly of said lip, an annular reinforcing rib formed integral with said valve element at the side thereof opposite said lip and of larger diameter than such lip, said rib and said lip combining to form a relatively thick annular radially inward portion of said valve element to lend substantial stiffness thereto, said valve element between said rib and said bead having a relatively thin highly flexible portion to provide for free movement of said lip toward and away from said wall, said bead being thicker than said flexible portion of said valve element to be retained in position by said channel.

In the check valve arrangement of the present application, a spring-biased resilient annular diaphragm is used. The diaphragm has a central opening having an enlarged integral bead portion about the periphery which engages the valve seat. A dual-function form uses a check valve having a pressure relief function permitting reverse flow above a predetermined pressure differential.

In response to the Final Action, the applicant submitted new pages 2 and 3 for the disclosure, and cancelled claims 1 to 34 in favor of amended claims 1 to 27. Claims 19 and 20 which were indicated as allowable in the Final Actior are now numbered 12 and 13. There is no indication which of the amended claims are supported by the supplementary disclosure as required by Rule 54 of the Patent Rules, but it has been determined from the applicant's Patent Agent that claims 7 to 27 are to be under the heading "Claims supported by Supplementary Disclosure." Amended claim 1 reads:

> A fluid valve comprising: housing means defining a passageway therethrough; a valve seat in said passageway; resilient, annular diaphragm means having a central opening therethrough and an enlarged integral bead portion disposed about the outer periphery thereof, said diaphragm means preventing the flow of fluid through said passageway except through said opening, said diaphragm means normally sealingly engaging said valve seat along a line surrounding said opening, and being provided with a zone of increased thickness in the area where it sealingly engages said valve seat, the entire intermediate portion of said diaphragm means disposed between said bead portion and said zone of increased thickness being relatively thin and flexible as compared to said bead, spring means biasing said diaphragm means against said valve seat into sealing engagement therewith, said diaphragm means being movable away from said valve seat to permit the flow of fluid from one end of said passage to the other end thereof through said opening when the pressure at said one end exceeds the pressure at said other end.

We give our attention first to the proposed amendment to page 2 of the disclosure. On page 2 at line 28 the applicant has added a reference to "the seat engaging surface of the zone being devoid of a sharply convex cross-sectional shape." This feature, however, was not disclosed in the application as originally filed. In the drawings the diaphragm is shown as "a relatively stiff central section 30 containing a centre passageway 32, an annular flexible section 34 extending outwardly from central section 30, and a peripheral sealing head section 36." The portion of the diaphragm that constitutes the "seat engaging" area is designated by the numeral 30. As viewed in figure 4, the cross-sectional view of this part shows several points wherein the intersecting surface lines intersect to form a "sharp" surface edge. There is no description or teaching of the "seat engaging surface of the zone being devoid of a sharply convex cross-sectional shape."

This feature is only shown in the supplementary disclosure in figure 12. Therefore the entry of the proposed amendment to the original disclosure at page 2 can not be permitted under Section 52 of the Patent Rules.

Consequently the argument that this feature is not shown in the Stelzer patent is immaterial, as it was not part of the original disclosure nor reasonably to be inferred from it, and cannot be the basis of a valid claim. Hence claim 1, which contains the statement that "the seat engaging surface of said diaphragm zone being devoid of a sharply convex cross-sectional shape", is not supported by the original disclosure as is required by Section 25 of the Patent Rules.

For that reason claim 1 should be refused. In addition claims 2 to 6 which depend directly or indirectly on claim 1 should be refused. As for claims 4 to 6, however, we find that they relate to the dual function check valve arrangement which is not found in the prior art and would be allowable if drafted in proper independent form (present claim 4 is dependent on rejected claim 1). This would comply with Section 57 of the Patent Rules which requires an application to have claims supported by the principle disclosure.

The substitution of a flat spring washer to bias the diaphragm in the applicant's device for the helical spring of the Stelzer patent has been rejected in the Final Action as being a mere substitution of one equivalent for another. Several patents were cited to show that the flat spring washer is well known, including U.S. patent 2,901,212 to Winet which relates to a valve flow control device. The purpose of the spring here is to bias the diaphragm to the seat. Stelzer uses a helical spring, a choice also made by the applicant in the original disclosure as filed. In the supplementary disclosure (figure 9), the applicant selected a combination of a helical spring and flat spring. Figure 12 of the supplementary disclosure shows the use of a flat spring to bias the diaphragm to the seat. Therefore the choice of a flat or a helical spring to bias the diaphragm is merely a design preference.

The applicant argues that the thick rib which Stelzer provides "between the inner and outer portions is not only a different construction than that claimed, but would have a different function." We note that the applicant also uses a thick rib portion (30, fig. 4) to provide an enlarged cross sectional mass at the valve seat contact area to ensure an adequate seal. Hence the function is the same as in the Stelzer patent.

We now consider claims 7 to 27, which fall under the heading "Claims Supported by the Supplementary Disclosure." Of this group we note that claims 7 to 9, 14 to 17 19 to 24 and 27 depend directly or indirectly on claim 1. Since the subject matter of rejected claim 1 could come within the provisions of Section 53 of the Patent Rules, we will consider this group of claims when combined with claim 1.

On considering the difference between the cited art and the invention covered by the combination in claim 7, we find in the latter the limitations of "the seat engaging surface of said diaphragm zone being devoid of a sharply cross sectional shape" and "the entire portion of the diaphragm means disposed between the head portion and zone of increased thickness being of uniform thickness throughout." Stelzer uses a "lip 23" as the portion of the diaphragm engaging the seat. The applicant states that the Stelzer construction would "result in the same surface of the diaphragm repeatedly engaging and disengaging the valve seat, resulting in much more wear than occurs with the present invention." In viewing the Stelzer device and its contacting diaphragm surface, we find that it does have a less round contacting surface, but we think this is a minor difference in design, and does not amount to an inventive difference.Until the applicant's rounded surface becomes worn in, its point of contact will be essentially the same as Seltzer's. After both are worn in, the point of contact in each case will be the same. Consequently there is no inventive feature in using a circular seat cross-section as compared to the "V" type shown in Stelzer.

Similarly the limitation that the intermediate portion of the diaphragm is thin and flexible as well as of uniform thickness throughout is not patentable. In the Stelzer patent the intermediate portion which is shown as 33 in the drawings is also thin and flexible, and of uniform thickness throughout. Stelzer states at column 3, line 13, that the "spring 35 can be relatively light, and this fact together with the high degree of flexibility of the thin annular valve portion 33 permits the valve readily to unseat for the exhaustion of air from the receptacle 16." (underlining added). A person skilled in the art would have no problem in selecting a diaphragm to be actuated within a specified range of pressure differentials. In our view claim 7 is not directed to a patentable advance in the art.

The features added by the remaining claims dependent on claim 1 relate to a circular cross section seating zone for the diaphragm, and the use of a flat washer type spring for biasing. These features do not add anything of patentable significance, and the arguments made against refused claim 7 apply to them. We believe claims 8, 9, 14 to 17, 19 to 24 and 27 should also be refused.

Independent claims 10, 18 and 25 - which stress the spring means to bias the diaphragm - do not cover a new or inventive combination. The argument to refuse claim 7 also applies equally well to them. There is no doubt that these claims show some modification over the prior art but we believe they do not display the necessary exercise of the creative faculties of the human mind such as to merit the distinction of invention. In Niagara Wire Weaving Co. v Johnson Wire Works Ltd. (1939) Ex. C.R. at 273 Maclean J. stated: "Small variations from or slight modifications of, the current standards of construction, in an old art, rarely are indicative of invention; they are obvious improvements resulting from experiences, and the changing requirements of users."

The subject matter of claim 11 which relates to the dual valve function arrangement would be allowable when drafted in proper form. As mentioned previously claims 12 and 13 have also been indicated as being allowable.

To summarize, claims 1 to 6 should be refused for lack of support by the disclosure. Claims 7 to 10 and 14 to 27 should be rejected as not reciting a patentable advance in the art. Claims 12 and 13, and the subject matter found in claims 4 to 6 and 11 are allowable.

G.A. Asher,
Chairman,
Patent Appeal Board.

I am in agreement with the recommendations of the Patent Appeal Board and refuse claims 1 to 11 and 14 to 27. I will, however, accept the subject matter in claims 4 to 6 and claim 11 if amended along the guidelines suggested. Claims 12 and 13 are, of course, allowable. The applicant has six months within which to amend claims 4 to 6 and 11 and to delete claims 1 to 3 and 7 to 10 and 14 to 27 or to appeal this decision under the provisions of Section 44 of the Patent Act.

J.A. Brown,
Acting Commissioner of Patents.

Dated at Hull, Quebec
this 10th day of February, 1976

Agent for Applicant

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