

Examiners' Report – Paper A 2009 (Electricity/Mechanics)

1. General considerations

1.1. This year's paper relates to a snorkel valve. In the client's letter a conventional snorkel valve is described in general terms as having a tube portion, a valve member in the form of a float and valve orifices. The valve member is movable between an open position where the valve orifices are open and a closed position where the valve orifices are closed by the valve member. Above water, gravity pulls the valve member down to the open position. Under water, buoyancy exceeds gravity so that the valve member is pushed up towards the closed position.

1.2. Figs. 2A-2C show a schematic view of a specific prior art snorkel valve (**Nautilus**) for use on a snorkel as shown in Fig.1. Under water, the Nautilus valve remains closed only as long as it remains in the upright position, see par. [010] of the client's letter.

1.3. In Figs. 3A-3D a schematic view of another specific prior art snorkel valve (**MagDiver**) is given. The MagDiver valve is an improvement of the Nautilus valve in that a magnetic holding means keeps the valve closed in any submerged position, even when the valve is upside down, see par. [015] of the client's letter. However, the snorkel valve remains closed upon resurfacing. This is because the holding force applied by the holding means is greater than the gravity force.

1.4. In par. [017] of the client's letter, a prior art publication in a journal (Scubaduba) is stated to disclose various versions of snorkel valves of the MagDiver type using different sets of magnets applying different holding forces. Some of those snorkel valves have magnets that are so strong that the snorkel valves do not open upon resurfacing. They will hereinafter be referred to as snorkel valves according to **Scubaduba I**. Some of the snorkel valves have magnets that are so weak that the snorkel valves open under water in some positions, similarly to the Nautilus valve. They will hereinafter be referred to as snorkel valves according to **Scubaduba II**.

1.5. In contrast to the prior art, the snorkel valve according to the invention fulfils both the following conditions:

- 1) it remains closed in any position under water and
- 2) it opens automatically upon resurfacing in at least one position, namely the upright position.

1.6. This is achieved in a non-obvious manner by not only configuring the holding means but also by adapting the mass and volume of the valve member, see par. [018] of the client's letter, such that the forces acting on the valve member fulfil the following conditions:

- when the snorkel valve is submerged, the holding force acting on the valve member in the closed position exceeds the force resulting from the gravity force and the buoyancy force acting on the valve member so that the valve member is held in the closed position for all positions of the snorkel valve,
- when the snorkel valve resurfaces, the gravity force exceeds the holding force acting on the valve member in the closed position so that the valve member moves to the open position in at least one position of the snorkel valve.

The client's letter describes three examples of the invention. In a first example, schematically shown in Figs. 4A-4D, the holding means comprises magnets for applying a force to the valve member to close the valve. In a second example, shown in Fig. 5, the holding means comprises tension springs for applying a force to the valve member to close valve orifices. In a third example, shown in Figs. 6A-6C, the holding means comprises a compression spring acting on the valve member in order to close a valve orifice.

1.7. The client wishes to protect all the examples of his snorkel valve in a European patent application.

1.8. Answer papers were marked on a scale of 0 to 100 points:

up to **50 points** could be achieved for an independent claim,
up to **35 points** could be achieved for a set of dependent claims, and
up to **15 points** could be achieved for the description.

The mark awarded to an answer paper was based on the total number of points achieved.

2. Independent claim (50 points)

2.1. An example of a set of features which could have been used as a good independent claim to a snorkel valve is given below:

Example solution

- (a) *Snorkel valve comprising*
- (b) *a valve orifice (8, 108),*
- (c) *a valve member (9, 109) movable between an open position where the valve orifice is open and a closed position where the valve orifice is closed by the valve member,*
- (d) *a holding means (13, 15, 115) for applying a holding force (F) to the valve member*
- (e) *the holding means (13,15, 115) and the mass and volume of the valve member (9, 109) being configured such that:*
- (f) *when the snorkel valve is submerged, the holding force (F) acting on the valve member in the closed position exceeds the force (R) resulting from gravity force (G) and buoyancy force (B) so that the valve member is held in the closed position in all positions of the snorkel valve,*
- (g) *the gravity force (G) exceeds the holding force (F) acting on the valve member in the closed position so that the valve member moves to the open position in at least one position of the snorkel valve upon resurfacing.*

Remarks to feature (a): The client's letter only refers to a snorkel valve. A claim relating to a valve per se could have also achieved full points.

Remarks to feature (b): "Valve opening" or "valve port" was considered equivalent to "valve orifice". A plurality of orifices would have unnecessarily limited the claim, see 2.3.5. Feature (b) could have been omitted from the claim, as long as the open and closed conditions of the valve were clearly defined in feature (c) of the claim.

Remarks to feature (c): The definition of "open position" and "closed position" was useful for clearly defining the invention in the remaining part of the claim, in particular the holding force in features (f) and (g). Alternatively, the claim could have referred to an open and a closed state of the snorkel valve.

Remarks to feature (d): Feature (d) provided novelty with respect to Nautilus. According to the examples of the invention given in the client's letter, the valve member of is held in the closed position by means of permanent magnets or one or more springs. It was considered essential to include a holding *means* in the independent claim in order to distinguish the "holding force" generated by the holding means from any "holding effect" caused by a buoyancy force or a gravity force. If the feature **holding means** was left out, and the claim merely referred to a holding force, points were deducted under clarity, see 2.6.3.

As described in par. [014] of the client's letter, the *magnitude* of the **holding force** may vary according to the position of the valve member. It was therefore important that the claim defined a magnitude condition of the holding force by the expression "acting on the valve member in the closed position". In the example solution, this is done in features (f) and (g), see also the remarks to features (f) and (g) below. Furthermore, the *direction* of action of the holding force in terms of its effect to close the snorkel valve had to be defined in the claim in order for it to be clear. For defining the direction of action of the holding force, the following example expressions could have been used: "acting on the valve member towards the closed position of the valve member"; "acting on the valve member to hold/maintain/keep the valve member in the closed position"; "acting on the valve member to close the valve member". In the example solution, this is done in feature (f), see also the remarks to features (f) and (g) below. Alternatively, the *magnitude* condition and/or the *direction* of action of the holding force could have been defined in feature (d).

Remarks to feature (e):

The purpose of feature (e) is to **link** structural features defined as being comprised in the snorkel valve (features a-d) and a set of conditions to be met by the snorkel valve (features f and g).

As first introduced in par. [018] of the client's letter, the invention lies in making a snorkel valve in which particular relationships between the holding force F, gravity force G and buoyancy force B on the valve member result in a snorkel valve which works "as desired", i.e. which remains closed in any position under water and which automatically opens at least in the upright position upon resurfacing.

Three parameters determine the forces F, G and B, namely the holding means, and the mass and the volume of the valve member respectively. Feature (e) defines these three parameters, all of which must be configured in order to meet the conditions set out in features (f) and (g) of the claim.

Since it is clear to the skilled person that the holding means is the only parameter for determining the holding force F, and that the mass and the volume are the only parameters for determining the forces G and B, full points could also have been achieved for a claim having a feature (e) which did not mention mass and volume but which defined that the "**holding means** and the **valve member** are **configured** such that...".

It is noted that a claim could have also received full points where neither the holding means nor the valve member were explicitly mentioned in feature (e), but then it must have been clear that the 'configuration' feature applied to the snorkel valve as a whole and not just to a part or parts of the valve, which on their own could not be configured to achieve the effects of the invention, e.g. "the snorkel valve being configured such that...". Otherwise the claim would have lacked clarity, e.g. "the holding means is configured such that", see 2.6.3.

Remarks applying to both features (f) and (g):

Feature (f) defines a first condition for the snorkel valve when submerged. Feature (g) defines a second condition for the snorkel valve. The invention can only be defined if **both** conditions are included in the claim.

The **holding force** F applied to the valve member when the valve is open is different from the holding force F applied to the valve member when the valve is closed. If, for example, the holding means is a magnet, the holding force applied to the valve member in the open position is weaker than the holding force applied to the valve member in the closed position. If the holding means is a spring, the holding force applied to the valve member in the open position may be stronger than the holding force applied to the valve member in the closed position. For clearly defining the invention in both features (f) and (g) the *magnitude* condition of the holding force could have been defined by the expression "acting on the valve member in the closed position". Alternatively, the magnitude condition of the holding force could have been defined in feature (d), see the remarks to feature (d), or elsewhere in the claim. Furthermore, the *direction* of action of the holding force is defined by the functional feature "so that the valve member is held in the closed position". If the direction of action of the holding force was defined elsewhere in the claim, e.g. in feature (d), see the remarks to feature (d), the functional feature "so that..." could have been omitted. Expressions such as 'overcomes' or 'is greater than' were considered to be equivalent to the expression 'exceeds'.

Remarks to feature (f):

A claim having all of the above example set of features except that feature (f) was **missing** entirely, would have lacked novelty with respect to the prior art described in par. [017] of the client's letter and published in the journal "Scubaduba", see 2.4. This is because it is implicit that the snorkel valves of Scubaduba comprising magnets that are "too weak" (Scubaduba II) will also always open in at least one position upon resurfacing.

If an answer paper had a feature (f) which merely stated a **result to be achieved**, then it was marked under lack of clarity, see 2.6.1.

A feature (f) having no mention of whether the valve was **submerged** or not, was also considered to lack clarity, see 2.6.2.

Instead of "any position", "any orientation" of the valve or an "upside down position" could have been defined. It was equally acceptable not to refer to any position of the snorkel valve at all because it is a necessary consequence of the force condition defined in feature (f) that it applies for all positions of the snorkel valve.

Remarks to feature (g):

Leaving out this feature lead to a lack of novelty with respect to MagDiver and with respect to the disclosure published in the journal "Scubaduba". This is because the MagDiver valve as well as the snorkel valves of Scubaduba comprise magnets that are "too strong" (Scubaduba I) and so they always remain closed in any position when submerged, see 2.4.

If an answer paper had a feature (g) which merely stated a **result to be achieved**, then it was marked under lack of clarity, see 2.6.1.

A claim having a set of features according to the above example solution but without the complete functional feature "so that the valve member moves to the open position in at least one position of the snorkel valve upon resurfacing" would have achieved full points, because it is a necessary consequence of the force condition defined in feature (g) that the valve member moves to the open position in at least the upright position of the snorkel valve.

If, however, the functional feature "so that the valve member moves to the open position" was present in a claim **without** specifying "in at least one position of the snorkel valve", this can be interpreted as meaning "in all positions of the snorkel valve" which would be an unnecessary limitation. Because of this ambiguity, points were deducted for lack of clarity, see 2.6.3.

If the expression "upon resurfacing" or "when not submerged" was missing from the functional feature "so that...", the claim was considered to be unclear, see 2.6.3.

2.2. This year, the only independent claim expected was a device category claim to a snorkel valve. Where an answer paper had an additional independent claim in a different category, e.g. a method of making a valve, points were only awarded for the device claim.

2.3. Unnecessary limitations

Following unnecessary limitations were considered to be major limitations, because they clearly excluded one or more described examples of the invention. Between 15 and 30 points were deducted in these cases.

2.3.1. A claim in which the **holding means** is specified to be a magnet (-30 points). A claim in which the **holding means** is specified to be a spring (-30 points).

2.3.2. A claim including unnecessary limitations to the **structure** of the valve member lost points depending on the number of described examples which are excluded:

- hollow (-15 points),
- solid (-30 points),
- filled (-20 points), in this case no points were deducted for 'hollow',
- rubber, water (-30 points), in this case no points were deducted for 'filled'.

2.3.3. As it is stated in par. [021] of the client's letter that G may substantially differ from B, any feature defining the following relative magnitudes of **B and G** without reference to F lost 20 points. For example claims defining: $B > G$, $B < G$, $B = G$, the force B is nearly compensated by the force G, G compensates B, the resulting force R is weak. No further points were deducted under clarity for such a feature.

2.3.4. A claim defining a **snorkel** comprising a snorkel valve has a limited scope of protection (-20 points). According to Fig. 1, the snorkel valve is releasably fixed to the breathing tube of the snorkel, see par. [004] of the client's letter.
Other unnecessary limitations:

2.3.5. A claim in which a **plurality** of orifices were defined lost 10 points. The snorkel valve of the third example has a passage in-between a collar and a ring-shaped body constituting the only valve orifice which is defined in this example, see par. [030], [031] and [032] of the client's letter.

2.3.6. Any reference in the independent claim to the particular shape of the end piece or the snorkel valve (e.g. hemispherical, mushroom-shaped) lost 10 points.

2.3.7. Any reference to one of the following **structural** features in the independent claim lost 5 points per feature:

- ring-shaped,
- a flat surface,
- a particular arrangement of a seal, e.g. sealing means inside valve member.

2.3.8. Any references to the following features per se in the independent claim did **not** lead to a deduction of points:
end piece, tube portion, seal, float (instead of valve member).

2.4. Novelty

An independent claim that was considered to lack novelty against any of the available prior art lost 30 points.

A claim defining a snorkel valve comprising features (a)-(e) and feature (f) according to the example solution is known from MagDiver, as well as from Scubaduba I. If a claim related to a snorkel valve only having features (a)-(e) and feature (g), it lacked novelty with respect to Scubaduba II (-30 points).

If, due to an unclear formulation, there were doubts as to whether or not the wording of the claim could be read onto a piece of the prior art, then points were deducted under lack of clarity, not under lack of novelty.

2.5. Inventive step

An independent snorkel valve claim which lacked inventive step lost 25 points.

2.6. Clarity

Up to 30 points could have been deducted for independent claims lacking clarity. The full deduction of 30 points was made where more than one clarity issue was found, and the sum of all deductions would add up to 30 points or more.

2.6.1. The problem solved by the invention could be split into two parts: to provide a snorkel valve (1) which remains closed in any position when submerged and (2) which moves to the open position in at least one position when not submerged. The independent claim should have clearly defined means for solving both parts of the problem.

Defining a **result to be achieved** in the independent claim, e.g. by stating these parts of the problem, resulted in losing up to 15 points per part:

e.g. the snorkel valve is arranged so that the valve member is in the closed position in any position of the valve when submerged, and in at least one position of the snorkel valve when not submerged, the valve member moves to the open position (-30 points).

2.6.2. As a buoyancy force will also act on the valve member when it is partially out of the water while submerging or resurfacing, solutions where no mention was made of whether the valve was **submerged** or not lost 5 points:

e.g. the holding force (F) exceeds the force (R) resulting from the gravity force (G) and the buoyancy force (B) acting on the valve member so that the valve member is held in the closed position.

2.6.3. Minor clarity deficiencies lead to a deduction of up to 5 points per deficiency.

As an example, when the valve is defined as comprising a force **without** defining a **means** for generating the force, e.g. a snorkel valve comprising a holding force F, 5 points were lost.

Another example is when in **feature (e)** only the holding means or only the valve member was defined as being configured such that the conditions of features (f) and (g) are met. The same applies if the mass of the valve member was mentioned without the volume or vice versa. In these cases, 5 points were lost.

An incomplete definition of the **holding force** which did not explicitly or implicitly define somewhere in the claim a magnitude condition of the holding force in terms of the holding force being defined "in the closed position of the valve member", lead to a deduction of 4 points for feature (f) and 4 points for feature (g). When the direction of action of the holding force was not defined, 4 points were lost.

If the functional part of feature (g) was present without explicitly or implicitly claiming "in **at least one** position" or "in an upright position" or "in a position of the snorkel valve", 5 points were lost.

If the functional part of feature (g) was present without mentioning "upon resurfacing" or "when not submerged" or "above water", 5 points were lost.

2.7. Formal matters

This year either a one-part form or a two-part form could have been used. An incorrect two-part form lead to a deduction of up to 3 points.

Partially incorrect or very incomplete reference signs in the claims resulted in a deduction of 1 point. The total absence of reference signs in the claims resulted in a deduction of 2 points.

3. Dependent claims (35 points)

3.1. Important requirements for awarding full points were

- **clarity** of the dependent claims, e.g. consistency of terminology with the independent claim,
- a good claim **structure** : a set of dependent claims having a structure which gave the client an appropriate set of fall-back options whilst at the same time being concise and having claims with correct back references was considered to have a good structure.

As a general rule, the number of points available for developing a claim or group of claims reflected the potential value of the resulting claim or group of claims as a fall-back position for the client and the difficulty of the drafting task involved.

Generally, no points were given for dependent claims with known structural features which were considered as not contributing a *different* technical effect when combined with the features of the invention than they already contributed in the prior art:
e.g. "A valve having a seal" or "A valve comprising a ring-shaped body".

Dependent claims grouping together features in such a way that the full potential of a particular fall-back option could not be realised, achieved considerably fewer points:
e.g. A dependent claim combining the group of features given below in (iii) of section 3.3 in a single claim achieved fewer points than separate dependent claims having the same features but structured as indicated in (iii) of section 3.3.

3.2. Where answer papers had a different independent claim, it was to be expected that the dependent claims would differ from the example dependent claims. This was considered on a case-by-case basis

3.3. Example feature set

In this section, an example feature set is defined which could have been used to formulate good dependent claims for an independent claim corresponding to the example solution discussed above. In the example feature set, groups of features for dependent claims are defined, each relating to specific aspects of the invention. The points awarded for each of these groups is indicated. It is however noted that there were different ways of grouping features in dependent claims whilst still achieving the full number of available points.

(i) A group of dependent claim features relating to the structure and material of the **valve member** (9 points).

Example:

- *the valve member (9, 109) comprises a hollow body (10, 110)*
 - *the hollow body (10, 110) is made from stainless steel*
 - *the hollow body (10, 110) is filled with a suitable material*
 - *the hollow body (10, 110) is filled rubber or liquid/water*
- *the valve member (9, 109) is a solid body*

(ii) A group of dependent claim features relating to the type of **holding means** (3 points).

Example:

- *the holding means comprises a magnet*
- *the holding means comprises a spring*

(iii) A group of dependent claim features relating to the example of Fig. 5 (8 points).

Example:

- *the snorkel valve comprises a tube portion (5, 105) and an end piece (6, 106) with said valve orifice (8, 108) allowing breathing air into the tube portion (5, 105)*
 - *the end piece (6) is fixed at (the end of) the tube portion (5)*
 - *the spring is a **tension spring** (15)*
 - *the spring is fixed at one end to the inner surface (16) of the end piece (6) and at the other end to the valve member (9)*
 - *the spring passes through the valve orifice (8) in the end piece (6)*

(iv) A group of depending claim features relating to the embodiment of Fig. 6 (13 points).

Example:

- *the body (110) and the end piece (106) are made in one piece to form the valve member (109)*
 - *the valve orifice (108) is a passage in-between a collar (111) projecting from the tube portion (105) into the end piece (106) and the body (110)*
 - *the spring is a **compression spring** (115)*
 - *the spring is fixed at one end to the inner surface (116) of the valve member (109) and at the other end to the tube portion (105)*
 - *the spring is adapted to move the body (110) towards the collar (111) to close the valve orifice (108)*

(v) A group of dependent claim features relating to a snorkel (2 points).

Example:

- *Snorkel (1) comprising a snorkel valve (according to one of the preceding claims).*

4. Description (15 points)

4.1. For the example solution, a brief acknowledgment of either the MagDiver or the Scubaduba valves having magnets as holding means was expected and awarded up to 5 points. A mere identification of the closest prior art in conformity with the independent claim received 2 points.

In case of a one-part form of the independent claim, the features known from the prior art had to be clearly identified in order to receive full points, pursuant to the Guidelines, C-III, 2.3.2.

4.2. A total of 10 points were available for a discussion of the problem (up to 6 points) and the solution (up to 4 points) in a manner consistent with the independent claim. Independently of the starting point, the objective problem always comprises two aspects, as stated in par. [017] of the client's letter: to provide a snorkel valve which meets both conditions, i.e. remains closed in any submerged position and automatically opens upon resurfacing. 3 points per aspect were available.

The problem is solved by not only adapting the holding means but also configuring the mass and volume of the valve member such that the force conditions as defined in features (f) and (g) of the example solution are satisfied (4 points).

Paper A (Electricity/Mechanics) 2009 - Schedule of marks

Category	Maximum possible	Marks awarded	
		Marker	Marker
Independent claim	50		
Dependent claims	35		
Description	15		
Total	100		

Sub-Committee for Electricity/Mechanics agrees on marks and recommends the following grade to the Examination Board:

☐ PASS
(50-100)

☐ FAIL
(0-49)
COMPENSABLE FAIL
(45-49, in case the candidate sits
the examination for the first time)

3 July 2009

Chairman of Examination Committee I