COMMISSIONER'S DECISION

SECTION 2 OF THE PATENT ACT - Nozzle Means Producing A High-Speed Liquid Jet

The application claims a nozzle producing a high speed jet. The application was refused because the claim defines the nozzle cavity by means of an equation, which the examiner considered to involve a mental step, rather than a physical difference. Any person practicing this invention however, need not exercise any judgmental step to determine what type of nozzle to construct. The claim defines the physical characteristics of the nozzle by a formula which limits the dimensions and physical shape, and clearly falls under the useful arts.

Final Action: Reversed

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This decision deals with a request for review by the Commissioner of Patents of the Examiner's Final Action dated February 9, 1976, on application 176,809 (Class 299-29). The application was filed on July 18, 1973, in the name of Lewis A. Glenn et al, and is entitled "Nozzle Means Producing a High-Speed Liquid Jet." The Patent Appeal Board conducted a Hearing on June 15, 1977, at which Mr. P. Hammond represented the applicant.

This application relates to a nozzle device producing a high speed liquid jet to be used in an apparatus to cut, break, deform or clean material. Figure 1, shown below, is a schematic sectional view of one half of an apparatus, showing the prior art contour (4) and the contour according to the present invention (5), with a solid piston.

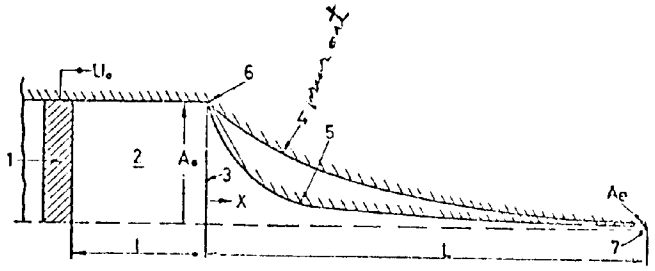

FIG. 1

In the Final Action the examiner refused the application because, in his view, the alleged invention is not within the ambit of Section 2 of the Patent Act, and on a secondary aspect that it was obvious over the art cited in the present application.

In the Final Action the examiner had this to say (in part) as follows:

> In view of the prior art, as shown by present Figure 1, the present claim differs from said art by dimensions only, which dimensions satisfy the formula or equation of claim 1.
>
> As the claim differs from the prior art by an equation only, which is a mental step and not a physical difference, the alleged invention is not within the ambit of Section 2 of the Patent Act.
>
> Once it is decided that the present nozzle forming the subject of applicant's claim is not distinguished (only dimensional distinctions are here involved) from other nozzles, the only novelty allegeable in the claim is the mental process by which the physical parameters of the nozzles are calculated and determined. Such a process of calculation cannot be regarded as invention within the meaning of the Act.
>
> It is not of course a circumstance fatal to the grant of a patent that a new manufactured article cannot be distinguished from previously made articles by physically defined characteristics, provided it can be distinguished in some manner, for in some instances an article could be claimed by the process of making, but in such a case the process must, to be allowable, particularise "novel physical" steps. The nozzle of claim 1 is distinguished only by the process of calculations by which its profile is determined. Such a process is purely mental and therefore not within the ambit of Section 2 of the Patent Act.

The applicant in his response stated his position (in part) as follows:

> ...
>
> The first objection of the Examiner in the Official Action appears to be based on the grounds that the subject matter of claim 1 is not patentable subject matter within the meaning of Section 2 of the Patent Act. Section 2 defines "invention" as meaning "any new and useful art, process, machine, manufacture or composition of matter or any new and useful improvement" thereto. Present claim 1 of the application is directed to a nozzle device comprising a nozzle with an internal cavity and a certain contour. It is submitted that a nozzle device falls readily within the

> scope of the terms "machine" or "manufacture" found in the definition of "invention". It seems highly probable that numerous nozzle devices have already been patented in Canada without any objection being made to the claims for such nozzles on the grounds that nozzles do not constitute patentable subject matter. A nozzle is a physical product which is manufactured by industrial processes much like any other product and it is sold in trade in the usual manner. It is not seen how there can be any serious basis for an objection based on lack of subject matter particularly in view of the submissions made hereinafter in connection with the significance of the two equations in claim 1 which determine the contour of the internal cavity.
>
> The Examiner also appears to be maintaining his objection to the nozzle device of claim 1 on the grounds that the claimed nozzle does not differ physically from the prior art. It is first of all noted that the Examiner has not cited any prior art against the claims in this application except for the admitted prior art referred to in the disclosure and illustrated in the drawings of this application. As explained in paragraph 2 of the first page of the application, a known nozzle has an internal contour whose radius exponentially decreases with distance from the nozzle entrance. In this nozzle the relative rate of area change is invariant over the entire contour. The contour of the known nozzle is illustrated by the line indicated by reference numeral 4 in Figure 1 of the drawings. In contrast, the internal contour of a nozzle constructed according to the present invention is indicated by the lower curve 5 of Figure 1. The only prior art which the applicant admits in its application is the nozzle illustrated by the upper curve 4 of Figure 1. This known nozzle does not have a contour lying within the limits defined by the two equations set out in claim 1. In fact the applicant has specifically stated and strongly maintains that no known nozzle has an internal contour with the dimensions called for by present claim 1. As can be seen readily from examining Figure 1, the equations of claim 1 define a contour which is distinctly different from the known contour illustrated by the upper curve 4 of Figure 1. Thus the Examiner's statement in the Official Action that the nozzle device of claim 1 does not differ physically from the prior art is incorrect.
>
> The Examiner also alleges that the only novelty set out in claim 1 is the mental process by which the physical parameters of the nozzles are calculated and determined. Again this statement is not correct in applicant's submission and, as explained above, the nozzle device of claim 1 does differ physically from the prior art....

At the Hearing Mr. Hammond brought forth some interesting and pertinent points. The basic issue before the Board is whether or not the subject matter of this application falls within the ambit of Section 2 of the Patent Act. Claim 1 reads as follows:

A nozzle device capable of producing a high-speed liquid jet for use in an apparatus to cut, break, deform or clean materials, said device comprising a nozzle having an internal cavity to receive a liquid column, said cavity having a continuously converging contour lying within the limits defined by the following two equations:

a) $$A/A_o = \left\{1 + \left(\frac{X}{L}\right)\left[\left(\frac{A_e}{A_o}\right)^{-1} - 1\right]\right\}^{-1}$$

b) $$A/A_o = \left\{1 + \left(\frac{X}{L}\right)\left[\left(\frac{A_e}{A_o}\right)^{-1/5} - 1\right]\right\}^{-5}$$

where
A is the variable internal cross-section
A_o is the value of A at nozzle entrance
A_e is the value of A at nozzle exit
L is the length of said nozzle from entrance to exit
X is the variable coordinate along the axis of said nozzle.

We point out at this time that "A" in claim 1 should, for better clarity, read: "is the variable internal cross sectional area of the nozzle."

We observe that no prior art has been cited against the claims of this application except for the admitted prior art set out in the disclosure. This prior art is exemplified by the contour designated by reference number 4 in Figure 1 of the drawings (shown above). The main objection in the Final Action is based on lack of subject matter within the ambit of Section 2 of the Patent Act.

The examiner stated that: "As the claim [claim 1] differs from the prior art by an equation only, which is a mental step and not a physical difference, the alleged invention is not within the ambit of Section 2 of the Patent Act."

What we are really concerned with is whether or not the novelty lies solely in the performance of certain judgmental steps. The ambits of the nozzle are defined by formulae which in fact describe the structure of

the nozzles. All nozzles coming within the limits of the formulae perform in the manner desired. Anyone wishing to practice this invention need not exercise a judgmental step to determine what type of nozzle to construct. He merely makes a nozzle coming within the metes of the claim. Whether the shape of the nozzle is described by a formula or in words is immaterial. In both cases what is claimed is a specific structure. In this instance the simplest way to describe the contours is by formulae, and we can see no valid reason to object. We are satisfied on the facts before us that there is no judgmental step involved in exercising the invention of claim 1. In the present case the formula is but another way of describing the dimensions of a structure, and its physical form. New machines and apparatuses have always been patentable if they involve inventive ingenuity, are useful, and are clearly defined in the claim.

We are satisfied therefore that claim 1 defines the physical characteristics of the nozzle in the form of an equation which limits the dimensions and physical shape of the nozzle and clearly falls under the useful arts. In our view the grounds of refusal under Section 2 of the Patent Act should be withdrawn.

On a further aspect of the ground of rejection the examiner stated that "... claim 1 does not define a novel structural difference from the known nozzle...." (see the action of April 17, 1975, and reiterated in the Final Action)

We find that in the equation concerning the prior art "n" approaches either negative or positive infinity. By contrast in the equation defining the nozzle of the present arrangement (see claim 1 supra) n is greater than or equal to -5 and less than or equal to -1. In other words, n must be a small negative number for the nozzle of the present

application. The examiner did not, as mentioned, cite any prior art in the Final Action, but relied on the prior art supplied by the applicant. The structure of the internal cavity of the present nozzle is clearly different from the prior art (see Figure 1 which shows the prior art contour of a nozzle and the contour according to the present invention). The applicant appears to have used a specific selection range for optimum results. We have no reason to disagree that, as emphasized at the Hearing by Mr. Hammond, there is a considerable difference in performance over the prior art and that the applicant has made a significant contribution to the nozzle art. The applicant has, in our view, produced a result in a new and more advantageous manner which required for completion a degree of inventive ingenuity.

In summary, we are satisfied that the applicant has made a patentable advance in the useful arts and we recommend that the decision in the Final Action to refuse the application be withdrawn. The amendment for clarity purposes, mentioned above, should be made to claim 1.

J.F. HUGHES
Assistant Chairman
Patent Appeal Board, Canada

Having reviewed the prosecution of this application and carefully considered the recommendation of the Patent Appeal Board I have decided to withdraw the Final Action. The application is returned to the examiner for resumption of prosecution.

J.H.A. GARIEPY
Commissioner of Patents

Dated in Hull, Quebec

this 8th. day of August, 1977

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