

The Limited Monopoly™

The Phelps Phenomenon - Was It “The Suit?”

by John Hammond, PE and Robert Gunderman, PE

Incredible.

The roar of the crowd in the Beijing Olympic natatorium has long faded, but the memories of Michael Phelps’ phenomenal run of eight gold medals will long remain. For our money, nothing beats the image of his mother Debbie Phelps melting “like the witch in the *Wizard of Oz*” (her words) following his 0.01 second victory in the 100 meter butterfly.

Throughout the Olympic swimming competition, world records were just washed away like so many sand castles built at low tide. But beyond the athletes and their incredible talent and training regimens, some of the buzz has been about the recent major advances in swim suit technology. In particular, Speedo® has come to dominate the competitive swimming market with its one-piece ankle-to-shoulder LZR® suit. So what is in the LZR® suit? Hey, it’s just a swim suit... how complicated could it be?

Competitive Surveillance – an Example

If you’re one of Speedo’s competitors – say Arena or Tyr – you want to know. And one way to find out is to do a focused patent search. When it comes to technical details, patents and published patent applications skip all of the marketing hype of a product. Yes, they can be dry and dull, but they do get to the point. They also tell you what your competition is up to with respect to protecting its intellectual property – and potentially blocking your product in the marketplace. So this month we’ll track down the LZR® suit in the patent literature, and in so doing, show you some simple tools and techniques for you to do the same regarding your competition. We’ll also summarize a few of the key features that make the suit fast.

We start with the [search page](#)¹ at the USPTO website. Here we have the choice of searching issued patents or published applications. Since it now typically takes

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two to three years from the filing date for a patent to issue in the USPTO, but only eighteen months from the filing date for a patent application to publish, searching

Turning to the published application [search page](#)², we have a number of data fields from which to choose. Since Speedo is likely the owner of the patent application (i.e. the *Assignee*), we will search “Speedo” in the “Assignee” field, and a couple of simple keywords, “swim” and “suit” in the patent specification filed. We enter the search string, “an/speedo and spec/(swim and suit)” and execute it. Voila! One published patent application, 2008/0141431 comes up – with the somewhat nondescript title, “Garments.” Following the link to the application, we open the PTO’s HTML text page of the application. A quick review indicates that we have found what we are looking for...

But not in the preferred format – the HTML page has no drawings. So we switch to one of several free patent document sites (Google Patents, [pat2pdf.org](#), or [FreePatentsOnline.com](#)), download a pdf of the application, and open it up. There it is. U.S. published patent application 2008/0141431, filed August 16, 2007, published June 19, 2008, and assigned to Speedo International Ltd. in London. So what does it say? Hold on, we’ll get to that. First, two more patent points.

Reviewing the bibliographic data, we see that this U.S. application claims priority to three applications filed in Great Britain in December 2006 and April 2007. So a quick international search is in order. We navigate to the Advanced [search page](#)³ of the European Patent Office (EPO) website, enter “Speedo International” in the “Applicant(s)” field, and “Garments” in the title field. This search turns up not one, but two Australian patent applications titled “Garments,” published March 3, 2008. Browsing the

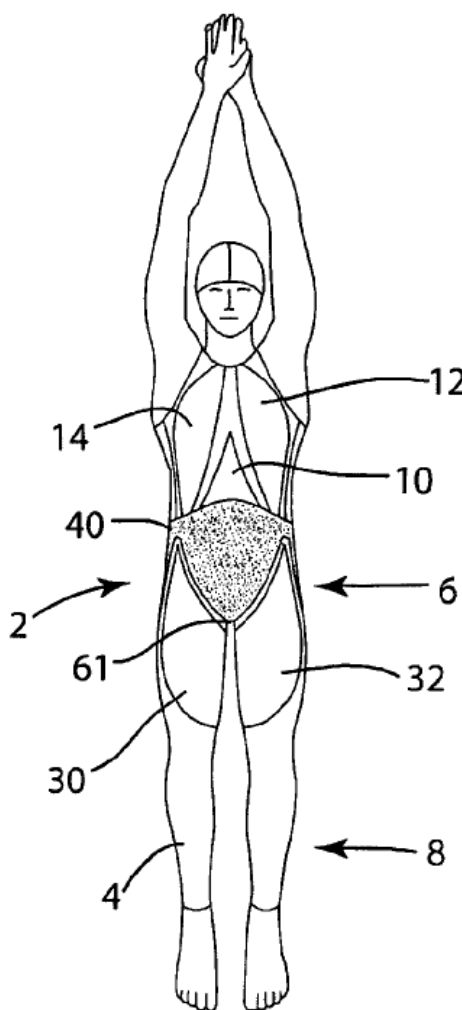


FIG. 1

published applications is the better choice. The published application database has more current information.

Bibliographic tabs in each of the respective pages, we see that each patent application has also been filed and published in the U.S., the EPO, Great Britain, Japan, and Brazil. We now have a much more complete picture of Speedo's patent strategy for protecting their latest swimsuit technology.

Final point. Our simple U.S. assignee and keyword search only caught one of the two published applications. Why is that? Herein lies the risk of keyword searching. It is easy, but it can miss important references. By entering the word "swim" as a keyword, we defined the search too narrowly. Had we used the wildcard "swim\$" in our search, which also flags swimmer, swimming, swims, and swimsuit, we would have caught both published applications on the first try. So think carefully about your keyword choices when you define your search string.

The Skinny on The Suit

But enough about the patent analysis. What about the technical details that are disclosed? The two U.S. applications cover a variety of "garments:" full body length suits, upper and lower half suits, and even caps. For the full length LZR®-type suits, here are some of the most distinctive features:

- A double layer of "stretchable elasticated fabric" compresses the abdomen of the wearer, improving form drag. It covers the entire torso, while not impeding movement of the arms, shoulders, and legs. Additionally, "at the rear of the suit, the inner core layer may extend downwardly... in order to compress the buttocks to improve form drag."
- A series of panels "of a higher stretch constant" are laminated on the outer surface of the fabric, on the front and rear of the torso, and on the upper legs. The panels further compress the torso and legs, and are also made of a material that "preferably has an outer surface that is more 'slippery' (i.e. exhibits lower surface drag in water) than the underlying base layer, so water flows over it more quickly than it would over the base layer alone (i.e. it is a 'fast fabric')." (The application doesn't say how one gets this flow effect – do the panels have a slip boundary condition?) One suitable material is a two-layer polyurethane film.
- To keep the profile of seams as small as possible, thereby minimizing seam drag, the seams are bonded instead of stitched. Likewise for the low profile zipper in the back.
- About eight variants of the suit are shown in the drawings and described. Each suit has its body coverage and panel locations optimized for one of the four competition strokes for a male or female swimmer.

Based on the overall teachings of these applications, it appears that the most significant feature of the LZR® suit is the effect that it has on compressing the swimmer's body into a more aerodynamic shape, while allowing freedom of movement (and breathing). A quick search on the Internet turns up much the same conclusion. For example, on their March 25, 2007 [blog](#)⁴, "The Science of Sport," Drs. Jonathan Dugas and Ross Tucker discuss the LZR® suit in detail, and how its proficiency in improving times has

become quite controversial. Apparently, some people think that wearing a suit that can physically transform the body from a canal barge into a racing shell is a form of cheating.

Professor Raul Arellano of the University of Grenada, who has extensively studied the biomechanics of swimming, states in the blog that, "The problem with the new swimsuits is that they improve the body shape much more than skin friction. And this improvement is very individual... the percentage improvement depends on the person's body shape. I have observed a master swimmer with a lot of fat around her abdominals reduce her time in 100m butterfly by 6 seconds to break the Master's world record. The changes in the body shape underwater using a smaller size full body swimsuit were clearly evident (the fat position was fixed and the perimeter reduced)."

Being engineers, we can state Prof. Arellano's conclusion much more succinctly, and with no lack of political correctness to boot: by wearing a Speedo LZR®, she optimized her Froude number.

So Will It Work For Us?

One of the requirements of federal patent statute 35 USC 112 is that the written description of an invention in a patent application must enable any person skilled in the art to which it pertains to make and use the invention. We're reasonably skilled in the art of swimming. So does that mean that if we each don a LZR®, we can go 50.5 in the 100 fly? Or could it be that Phelps' grueling training regimen, 12,000 calorie per day diet, mental toughness, and 6'3" frame has something to do with his success? We suspect the latter factors made the difference.

On the other hand, given Prof. Arellano's analysis above, and considering that we have a little more room for optimization of our Froude numbers than Micheal Phelps has, a LZR® would probably be good for a decent boost. But at a price of \$550, perhaps a pair of dual quads for the hot rod would be a better choice for getting more speed.

1. <http://patft.uspto.gov/>
2. <http://appft1.uspto.gov/netah/html/PTO/srchnum.html>
3. http://ep.espacenet.com/advancedSearch?locale=en_EP
4. <http://www.sportsscintists.com/2008/03/speedos-lzr-swimsuit.html>

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