



Freedom to Operate.

How a rather late identified third party patent almost killed an innovation project – but ultimately resulted in a significantly improved product that has innovated the protective clothing industry.

Many sports, but also many work environments require protective clothing to prevent athletes or workers from severe injuries. However, due to the rigidity of the material often used for this kind of clothing, it can be rather uncomfortable to wear. This is what made Richard Palmer and Philip Green, both material scientists at the University Hertfordshire/UK and passionate snowboarders in their free time, think about developing a new material that would be flexible but stiffen on impact.

The present case study highlights the importance of Freedom-to-Operate analyses by spotlighting Palmer's and Green's journey in developing and patenting this new material, which took a sudden and unexpected turn, when they found out that their initial invention had already been patented by someone else. But it also tells the story of how, in the end, this shock prompted them to come up with an even better invention that laid the foundation for a very successful company.





Background

How it all started: developing innovative equipment that is both protective and comfortable

Protective wear be it for sportsmen, soldiers or industrial workers had long been rather uncomfortable due to the often rigid and stiff materials incorporated into these garments. Aiming to innovate protective clothing, the two British material scientists Richard Palmer and Philip Green wanted to come up with a protective equipment that was rather flexible and thus comfortable to wear, but still provided full protection when needed – for instance in case of a sudden crash or collision.

They started working with so-called dilatant materials, which had been around for quite some time, but so far had only been commercially applied for kid's toys. These are fascinating materials: a liquid and very flexible substance when stationary but turning solid upon impact—and thus protective.

Dilatant Materials

Most substances show no change of viscosity under shear stress or upon impact: water for example shows no change in viscosity when shaken or stirred very heavily. However, there is a group of materials, so-called dilatant materials, that exhibits exactly the opposite behavior under the aforementioned circumstances: its viscosity increases, turning from free-flowing into solid.

Hence, they started to experiment with this material in order to use it for protection purposes: The classic approach was to keep the material inside a certain container, but the container was too restrictive, taking away the advantage of the dilatant's flexibility in normal use. Plus, this approach had proven to be not very functional.

They came up with the idea to impregnate an open cell foam with the material so that the foam served as a sort of container, yet remaining very flexible and being able to adjust to the movement of the body for example.

They did a lot of experimenting and testing both in their lab and kitchens at home to identify the best conditions to impregnate the foam: dissolving the material in a certain solvent, pouring the liquid into the foam and “baking” the foam in their oven so that the solvent would evaporate, leaving the material equally distributed inside the foam.

Freedom-to-Operate

In simple words, Freedom-to-Operate (FTO) describes the ability to perform a particular commercial activity based on a certain technology, product or service without infringing third parties' Intellectual Property (IP) rights. This necessitates an FTO search that informs you about third party IP, which might be enforceable in the specific country where the technology, product or service shall be commercialised and marketed.

At the same time and from the very beginning, they started thinking about ways to commercialise their product. Thus, seeking appropriate IP protection for idea was on their minds early on. In addition, they applied for government funding for their research. They were successful and were granted the funds, but the funding agency also placed great emphasis on proper IP protection. Therefore, they were glad that they had already filed a patent for their invention rather early in the process, which also helped them attract additional investments beyond the initial government funding. When preparing their patent application together with their IP attorney, some research for existing third party IP was conducted in order to get the green light for the patent application and the envisaged commercialisation of their product. At that point no relevant patent was discovered that would pose a risk to their IP and its commercial exploitation later on.



Challenge

A big shock: finding out that their invention had already been patented by someone else

Towards the end of their priority year, one evening Richard sat at home late at night, browsing the Espacenet database of the European Patent Office (EPO) to check the landscape for relevant patents once more. All of a sudden, he came across a recent Japanese patent, which exactly claimed what they were applying for. This came as a total shock and surprise, since this particular patent had not come up in any of their previous searches.

Early the next morning Richard and Philip discussed what to do and had to make a very difficult decision: either give up the whole project after all the hard work, time and efforts they had already invested over the past years, or try hard to find a new solution under immense time pressure¹.

¹In theory, there would have been a third option: to carefully examine the legal status of the third party patent. The patent might have been a) only be valid in Japan or b) it might have been expired. In this case, they would have been able to commercialise it everywhere except in Japan (a) or would have had no problem at all in terms of commercialising (b). In any case, however, they would not have been able to get patent protection for their invention. Since Richard and Phil considered a solid IP protection as a prerequisite for commercialising their invention (and basis for further funding), they decided that this third option was not a viable one.

Note: Identification of third party IP which is enforceable in a certain region in which you would like to commercialise your products/services (as an example described above in option a and b) actually is the (narrow) definition of FTO. If a proper patent protection is considered as a necessity for commercialisation, then the FTO-search needs to be combined with a patentability search. The latter aims to identify prior art, which can prevent your patent application no matter whether the patent is valid in a specific country only or valid at all or already expired a long time ago.



Previous Actions

A fresh start: back to the lab!

It did not take the two researchers long to decide that giving up was no option. Thus they returned to the lab to use the remaining few weeks of their priority year to come up with a different and hopefully even better solution. After countless new experiments they finally succeeded.

They developed the idea not to impregnate the (dissolved) material into the existing foam but to add the material to one of the two compounds of the (polyurethane) foam, before the two compounds were mixed and the actual foam was created. Not only was this novel approach not protected by the existing patent, it also had significant technical advantages over the previous one, due to the creation of a closed cell structure (versus the previous open cell structure) with the material manifested in the cell structure.

For instance, the old impregnation approach had been less environmentally friendly and less suitable for a scalable process. The new closed cell structure in itself is better at absorbing impact energy and reducing the pressure transmitted. As the dilatant material was dispersed as a discrete phase within the cell structure, it imparted the strain stiffening effect more efficiently to the polyurethane foam.





Outcome & Next Steps

Changing things for the better: a patent-protected invention for enhanced protective clothing

Luckily, Richard and Philip were able to invent this new method just in time before the end of the priority year. Also, fortunately their original patent application had been phrased widely enough thus enabling them to now modify and adjust the initial claims to appropriately describe the new invention.

Strange as it may sound - given all the trouble the prior art created – it was the very identification of this prior art that ultimately forced them to think of an even better solution than before. Although hard to admit, the original idea would never have been commercially successful on a larger scale.

Of course it might have been easier if they would have discovered the prior art earlier in their project, giving them more time to come up with an alternative and even better approach. On the other hand, there might have been the risk that they had totally given up the project. Due to the fact that they found out about the existent patent at such a late stage in their project, abandoning their mission simply was not a viable option anymore: they had already invested too much time and effort in the project.

Clearly, this should not serve as an excuse to do an FTO search rather late, quite the contrary: you should look at prior art early on in the project. This will make sure that you:

- Don't waste time and money
- Will make sure that you don't develop a solution which already exist
- Will help you think more broadly about potential other solutions

Especially the last point turned out to be very beneficial for Richard and Philip: looking at prior art can provide you with a source for new ideas and inspirations and will help you expand your way of thinking.

In the end they were able to develop an innovative material, which was perfect for protective, yet comfortable clothing. This patent-protected innovation laid the foundation for the start of their highly successful company D3O (www.d3o.com), which offers a wide range of protective equipment for athletes, industrial workers or soldiers.



Lessons Learned

Have you ticked the boxes?

- ✓ FTO search is very important and should be started early on in the project
- ✓ Looking at prior art is not only a necessity for patent protection or commercialization, but is a great source of ideas and inspiration
- ✓ Proper IP protection is important for funding agencies and investors (no investment without IP protection)

Further reading & references:

- Article on Freedom to Operate:
www.iprhelphdesk.eu/ip-highlights/ip-special-FTO/article
- Video of the European Patent Office on the invention:
<https://www.youtube.com/watch?v=6whCH0Gtxwk>



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