

PATENT PROTECTION IN THE MARINE INDUSTRY: INTERNATIONAL LEGAL FRAMEWORK AND STRATEGIC OPTIONS*

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Abstract

The legal protection of intellectual property is becoming increasingly important for developers of new technology, and the highly international marine industry faces some particular challenges in obtaining effective worldwide protection of innovation. Written for engineering professionals and managers in the marine industry, this paper takes a practical view at the international legal framework for patent protection of maritime inventions. A brief introduction to patents is first provided, summarising important aspects of the patent system. The highly important exception from infringement for ships in international traffic is then reviewed and its practical implications discussed. Finally, some potential strategies for patent protection of maritime inventions in light of the current statutory framework and legal precedent are presented.

Keywords: marine, maritime, ship, patent, infringement, intellectual property

1. Introduction

The patent system has a long tradition, dating back several hundred years in countries such as the United Kingdom and the United States, and is through international treaties becoming more and more standardised throughout the world. While the societal benefits of the patent system remains debated, it is no doubt that legal protection of intellectual property (IP) is becoming increasingly important for developers of new technology. Well-established international agreements ensure that worldwide protection can be obtained for an invention, independent of the citizenship or country of residence of the inventor. In addition to acting as an incentive for innovation, this is intended to contribute to a fairer global marketplace through, among other things, ensuring that the returns on investment in technological development are not diminished by counterfeit goods, or that the intellectual capital of developing countries can be protected to avoid unfair exploitation.

These international agreements on intellectual property, signed by practically all industrialised countries, also regulate how national patent rights can be enforced against vessels, vehicles, and aircraft of other countries. This paper reviews and discusses practical aspects relating to patent protection of new technology in the marine industries, particularly in light of the highly important “temporary presence” exception, providing that patent rights cannot be enforced against visiting foreign ships.

It should be noted that several other legal instruments for IP protection also exist, such as copyright, rights in designs, and unfair competition regulation. (See, for example, Glenn [1] for an overview.) In this paper, only patents will be discussed.

1.1 Examples of maritime innovation

To illustrate some current areas of innovation in the maritime industry, for which the topics discussed in this paper could be relevant, a few examples will be briefly described. The chosen examples are not intended to endorse any particular technology, nor should they be read as an opinion on the strength of a (potential) patent; they are merely intended to illustrate the wide range of maritime-related inventions for which international protection could be desired. In particular, the distinction between inventions relating to vessel structural features or system-critical components and those relating to accessories and/or auxiliary systems should be noted. The potential importance of this will be discussed in more detail below.

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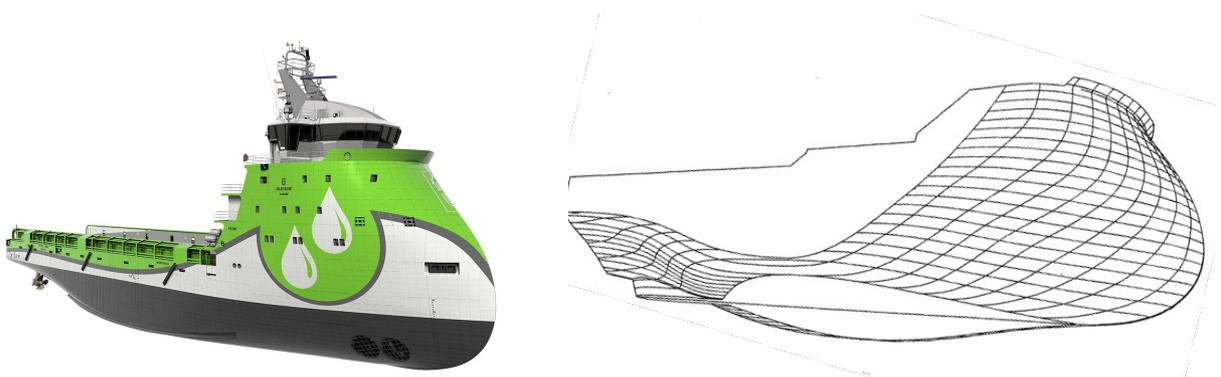


Figure 1: Ulstein X-Bow design [2]. (a) Illustration of a ship using the concept. [Copyright, Ulstein Group; reprinted with permission.] (b) Patent drawing.

Figure 1 shows the Ulstein X-Bow design [2]. The concept, intended in particular for vessels engaged in marine operations, such as pipelaying, platform supply, and anchor handling, employs a bow section which has conventional form below the waterline but is backward-facing above it. The advantage of the bow shape is that it reduces the reflection of incoming waves and wave slamming, thereby reducing energy losses, as well as providing better vessel behaviour in the water.

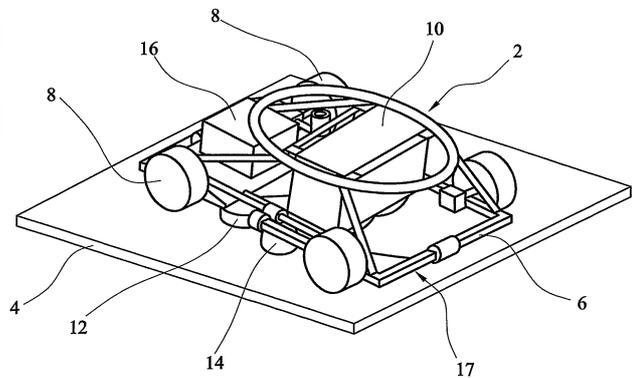
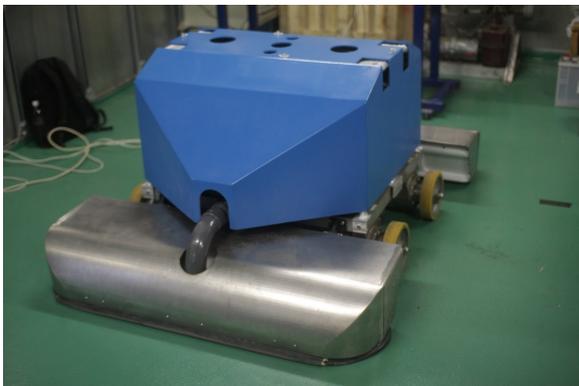


Figure 2: Ship hull inspection and cleaning robot [3]. (a) Photograph of prototype unit. (b) Patent drawing.

Figure 2 shows a hull cleaning and inspection robot developed at Newcastle University, UK [3]. The unit is fully autonomous and uses magnetic landmark recognition of surface and subsurface features (such as welds between plates and features of the support skeleton of the ship) to determine its position and navigate around the ship hull. Magnetic hull structural integrity inspection can be carried out, as well as cleaning of the hull below the waterline, thereby reducing drag and fuel consumption.

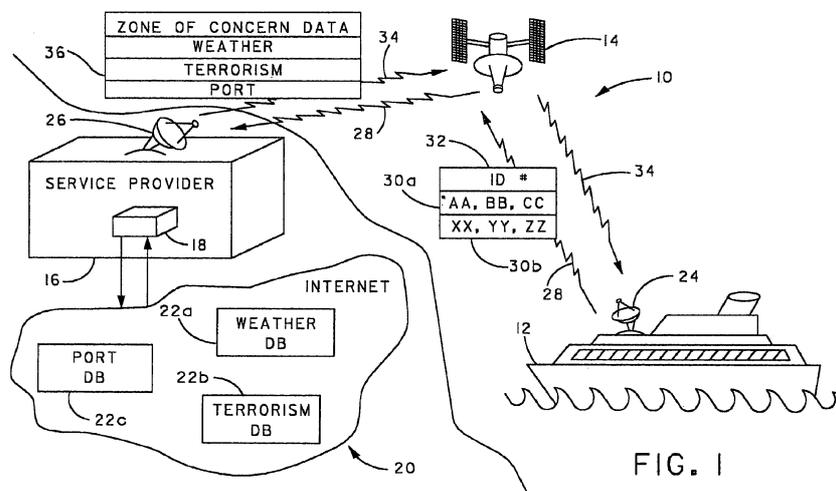


Figure 3: Maritime data transmission system concept illustration [4].

Figure 3 shows a maritime data exchange system [4]. The system allows shore-based databases of information relevant to the operation of the ship to be transmitted and made available on board for decision support. Potential zones of concern in the planned route, identified from, for example, information on terrorism or piracy, weather data, or coast guard assistance data, can be utilised to ensure safe and efficient ship operation.

Some further examples of maritime-related inventions were discussed by Armstrong and Black [5]. Clearly, there is a vast range of areas of innovation in the marine industry. These include ship design, propulsion and machinery, navigation systems, safety equipment, auxiliary systems (such as machinery condition monitoring or energy management), cargo handling and storage systems, shipyard production methods, etc. In addition, inventions relating to logistical methods or methods of operating a fleet of ships can be protected in some countries (such as the US), but for example in Europe this may be considered a method of doing business and thereby be excluded.

1.2 Patent rights and infringement

With some exceptions (which typically include areas such as private use, use for non-commercial or research/experimental purposes, or governmental use in certain fields¹), a patent grants the owner a legal right to stop anyone using a patented invention in that country. This includes most commercial activities, including using or offering to use a patented process, and making, importing, keeping, using, selling, or offering to sell a patented product or a direct product of a patented process. It is usually up to the patent owner to spot infringement and to take action against an alleged infringer, through gathering evidence (on his own and/or with the assistance of the customs authorities) and bringing legal action before a court. Identifying infringement can, of course, be a major challenge, since one usually has no access to a potential infringer's production facilities or ships in operation; nor is it possible to check every article on the market for infringement. However, on request by the patent owner, the customs authorities can assist by conducting searches and are also able to immediately seize any infringing articles that they find.

Importantly, a patent only gives *negative rights*; the patent holder can stop others from using the patented invention but has no “right to use” as such. It is perfectly possible to patent an improvement to a technology already patented by someone else. For example, a ship designer who, upon seeing the Ulstein X-Bow concept, gets an idea for a new and better internal structure for this design, could apply for a patent for this idea. This would, however, not give the inventor a right to start selling ships with Ulstein's protected bow design. Conversely, Ulstein could not implement the new improvement without a license from the inventor. For business strategic purposes, the distinction between a patent portfolio and a product portfolio should therefore always be kept in mind: A patent determines only what you can stop competitors from selling, not what you are allowed to use in your own products.

Patent rights are national (there is no such thing as a “world patent”, only international and regional application procedures²) and a patent must be obtained in each country where protection is desired. A patent is valid in the complete territory of the issuing country, which includes both land areas and, importantly for maritime inventions, territorial waters. Since it provides the patentee with all commercial rights to the invention in the territory of the issuing country, a patent would, in theory, be enforceable against any ship entering or passing through the territorial waters of that country. However there are international conventions regulating this for foreign ships, which include exemptions from patent infringement in certain situations.

2. The temporary presence exception for foreign ships

The Paris Convention for the Protection of Industrial Property is an international treaty, first signed in Paris in 1883. It currently has 173 contracting members, including most industrialised countries. Among other things, the convention regulates the priority system for patents, which simplifies the process for an applicant wishing protection in multiple countries.

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- 1 Notably, this includes use in military applications, hence a patent owner could normally not prevent use of patented maritime technology in a country's naval forces. However, compensation, in the form of an appropriate royalty, must usually be paid.
 - 2 These include the world-wide “PCT route”, which allows patent applications in a large number of countries to be filed in a single procedure, and regional systems such as the European Patent Office, which can also examine and grant a bundle of national patents based on a single application. After a patent is granted, any dispute, such as infringement or patent validity questions, are handled individually by national courts.

For the maritime industry, the Paris Convention also provides an important exception, which is that a patent in a member country cannot be enforced against a visiting ship belonging to another member country when that ship is in international transport. (There are also similar provisions for aircraft and land vehicles.) The actual wording of Article 5^{ter} of the Paris Convention is:

In any country of the Union the following shall not be considered as infringements of the rights of a patentee:

(i) the use on board vessels of other countries of the Union of devices forming the subject of his patent in the body of the vessel, in the machinery, tackle, gear and other accessories, when such vessels temporarily or accidentally enter the waters of the said country, provided that such devices are used there exclusively for the needs of the vessel; [...]

The exception is intended to avoid territorial patent rights hindering international commerce, and to avoid private citizens having power to interfere with foreign trade (see, for example, the discussion in Cali [6]). Notably, the exception covers only the use of an invention, and it thereby protects shipowners involved in international transport during the normal operation of their fleet. Without the exception, a shipowner would risk facing different claims of patent infringement in the different ports that a ship calls, as well as potentially disrupting search and seizure of the vessel if a national patent owner brings legal action.

For an owner of maritime intellectual property, this provision has the potential advantage that the invention would only have to be protected in the flag state of a vessel to prevent unauthorised use, even for a ship operating world wide. A technology developer could strategically choose large flag states in order to get broad protection for his inventions at reasonable cost, eliminating the need to patent in every country world wide. However, if the flag state has a non-functioning patent system, then the protection of such technology could become virtually impossible; internationally the ship falls under the Paris Convention exception while in the home country a patent cannot be obtained or cannot be enforced. With the emergence of open ship registries and “flags of convenience”, this loophole is indeed one of major concern, a fact which has been pointed out by a number of legal commentators (see, for example, Anderson [7] or Sharma and Forrest [8]).

In order to determine the impact of this provision for patent owners, it is necessary to analyse it in more detail and look at case law in which courts have applied this exception. The two main questions that need to be addressed are:

1. In which cases does a ship *temporarily or accidentally* enter the waters of another country?
2. Which components are used *exclusively for the needs of the vessel* (and which are not)?

2.1 Temporary or accidental entry

The first condition, temporary, indicates time-limited, and there is some case law available which has analysed and interpreted this. Clearly, temporary cannot mean any length of stay for any purpose, as that would include all ships not built and dismantled in the country. On the other hand, defining temporary as a specific length of time would be very difficult. Closest to a specific definition was a German court in the Rolltrailer case [9], in which the court noted that German domestic law relating to motor vehicles considers a stay of up to one year to be temporary. Based on this, the Hamburg District Court went on to state that for a stay to be considered non-temporary it would have to be of “at least several months.”

Most of the courts that have dealt with this problem have, however, adopted a different methodology in defining temporary, namely to interpret it in light of the underlying purpose of Article 5^{ter}. That is, a vessel entering a country with the *sole purpose* of taking part in international commerce, and then to depart, is considered to enter temporarily. (See Cali [6], Stena [10] and National Steel Car [11].) This includes completing a voyage, turning, and starting a new voyage, but with the purpose of the visit as the key factor, not the specific duration of the stay. Hence, the distinction is between operations that are purely international and those that involve domestic freight: a vessel involved in the movement of goods between domestic ports, even as part of an international route, would not fall under this definition of temporary. (Such a situation is briefly discussed in National Steel Car [11].) This interpretation would, however, not prevent a vessel in international traffic from calling in consecutive ports in one country, as long as it didn't engage in transport of goods or people between those ports.

Importantly, this definition of temporary allows regular and frequent entries, a fact that is well-illustrated by the Stena [10] case in the United Kingdom. In this case, it was claimed that an Irish ferry making three to four scheduled daily crossings between Ireland and England infringed a UK patent. (The patent described a

structural feature of the ship hull, and an equivalent Irish patent did not exist.) However, the English courts found that the ferry was involved in interstate travel and that, even though the ferry entered UK waters regularly and several times every day, each visit was temporary. Therefore the UK patent could not be enforced against the vessel or its owners. In the United States, the Cali [6] ruling concluded equivalently for aircraft with regular, scheduled visits.

What would constitute an *accidental* entry has not been discussed much in the existing case law, but some commentators have tried to distinguish this from a temporary entry. An example of an accidental entry could be an unplanned visit, such as a ship seeking refuge in a foreign port due to bad weather. Notably, there is no time limitation for an accidental entry (otherwise the word accidentally in the convention text would be superfluous), hence a patent holder would in theory not have any rights against such a vessel even if it remained in the country permanently. However, it is clearly not the intention of the convention to allow a vessel to accidentally enter a country and then engage in domestic commerce. More likely is an interpretation which covers a ship not leaving a country due to it being dismantled or put out of service (therefore falling outside the definition of temporary). As is illustrated by the lack of case law dealing with accidental entries, it is, however, unlikely that this will have any large practical importance.

2.2 Use exclusively for the needs of a vessel

Unlike for the temporary presence requirement, only a limited amount of case law discusses in detail which components and devices are used *exclusively for the needs of a vessel*. There are some clear cases: cargo is obviously not included, whereas for example the machinery and associated components for vessel propulsion are explicitly mentioned in the convention text. Arguably, components that are integral to the operation of the ship will be included. In addition to the machinery and propulsion system, this must include components whose removal will render the ship not seaworthy, i.e. without which the ship cannot operate safely or cannot operate at all. Examples of this will include safety equipment, navigation systems, provisioning necessities for the crew, etc. It should be noted that the needs of a vessel may differ between ship types: an LNG tanker will need a cryogenic refrigeration system, whereas a sewage treatment plant may be essential on a cruise ship.

A literal interpretation of the convention text (“in the body of the vessel”) may indicate that inventions used in the construction (the “body” itself) of the vessel should not be covered. However, the intention of Article 5ter is clearly to include inventions used in the construction of the ship, for example the design of the hull. This is expressly set out in the equivalent provision for land vehicles, indicating that “in the body” should include its construction, and this interpretation is also supported by case law, from among other English [10] and US [11] courts.

While it seems clear that the exception must apply to anything integral to ship operation, there will be many components for which it is not immediately clear whether they should fall under the exception. Tools for maintenance and repairs are, for example, needed by the vessel, although they are not a part of the machinery as such. The same will be the case for computer-based voyage planning or cargo management systems, despite that it is not impossible to operate the ship without them. Other components which are used for the needs of the vessel but that are not strictly essential for ship operation may include systems for exhaust gas cleaning or ballast water treatment. However, in light of the broad and purposive³ interpretation of Article 5ter demonstrated in the available case law, it appears very unlikely that a court would consider such systems to fall outside the exception.

More debatable may be inventions that are not used in or needed for the operation of the ship at all. For example, there is much innovation and a high number of patents being filed in the personal entertainment industry. Is a TV set, a DVD player, or a video game in the crew common room used “exclusively for the needs of the vessel”? Similarly, a cruise ship needs to entertain its passengers; does that mean that arcade games, fitness room equipment, and sun tanning beds fall under the exception? Some commentators believe so, such as Moffat [12], who stated that “[i]t might well be argued that every piece of equipment throughout a ship, whether it be a winch or a can-opener, is employed exclusively for the needs of the ship”. Such a broad interpretation appears quite probable, since it would be consistent with argumentation in previous case law as well as the underlying intention of Article 5ter, i.e. to relieve vessels in international trade or traffic from having to deal with the varying patent rights in different countries.

3 In line with the lawmaker's intention and less strictly on the specific wording of the statute.

3. Strategic options for maritime IP protection

As described above, there is a significant body of case law to indicate that courts will interpret the temporary presence exception broadly, with UK, US, and German courts having applied very similar reasoning and argumentation. Considering this, it can not be advisable to rely on a court holding the use of a patented invention on a foreign ship in international traffic to fall outside this exception. This will in particular be the case for technical inventions which are used for some operational purpose on board, whether these are essential for the running of the ship or not. The key question for the inventor is: what strategies can be adopted for patent protection of maritime inventions? To provide some insight into this, some options for protecting inventions used in international shipping will be outlined and discussed in this section.

3.1 Protection in major shipbuilding countries

In most industries, the preferred option to enforce patent rights is to target manufacturers and sellers of the patented invention. While commercial use of a patented invention also constitutes infringement, targeting manufacturers (for example shipyards) often has many advantages as opposed to taking action against end users. First, in many industries there is usually only a limited number of manufacturers, whereas the number of end users can be substantial. Also, manufacturers are often larger entities than end users, therefore they have more economic power and it can be easier to obtain damages. Second, there are less exceptions to infringement behind which a manufacturer can hide, since the sale of a patented product generally constitutes infringement. For the use of an invention there are typically a number of defences that can be claimed, such as private use, use for research purposes, or use in exempted industries. Moreover, taking legal action against end users may generate a bad relationship to customers and create bad publicity, which may influence future sales.

A patent in a shipbuilding country can prevent shipyards or suppliers in that country importing, making, using and/or selling an invention without a licence. Collecting sufficiently strong evidence for an offer to sell or a sale is often easier than for suspected infringement in the form of use on a ship; such evidence can, for example, be gathered using a private investigator posing as a potential buyer. Moreover, unlike a ship, a shipyard is stationary, hence if sufficient preliminary evidence can be obtained it is straight-forward for a court to order a search of the premises of the alleged infringer.

The world's largest shipbuilding country is South Korea, followed by China, Japan, and the European Union. The EU countries and Japan have mature and well-established patent systems, allowing effective protection of intellectual property rights for both domestic and foreign rights owners. The situation for China and South Korea is somewhat different. China's patent system is in rapid development, and even though the country has only been part of the main international treaties on IP for approximately 25 years, it is now the country in the world with most IP disputes, having overtaken the USA [13]. Particularly for foreigners, enforcing patent rights in China has until very recently been associated with significant problems, such as contradictory case law, different practice between courts, low damages awarded, local favouritism and corruption [14]. However, with the rapidly increasing numbers of patents filed by foreigners and a more mature and experienced IP litigation system, the situation is improving, and foreign rights holders already have reasonable chances of enforcing their patent rights in China, particularly if pursued in large business centres such as Shanghai or Beijing [14,15].

The legal framework for the protection of intellectual property in South Korea is possibly somewhat more developed than that in China, but similar in that major developments have taken place over the recent years. The Korean government have made significant efforts to develop the country's economy and attract foreign investment, arguably with great success. This has been reflected in changes in the law to comply with international trade agreements (such as TRIPS), as well as in the legal practice in the judiciary system. In particular, international standards for the enforcement of intellectual property rights are increasingly being adopted, making effective enforcement possible for both Korean and foreign rights holders [16].

Patenting in a major shipbuilding country will give the IP owner rights to stop unauthorised activities (such as manufacturing and sale) by shipyards and other suppliers in that country. This could give effective protection for inventions that must be supplied with the ship, such as those relating to structural features or the machinery system. However, it may not provide adequate protection for inventions that can be retrofitted on board and which do not need to be delivered with the ship at handover from the shipyard. In such cases, someone could circumvent patent rights by supplying the invention from a country in which patent protection has not been sought and installing it in that country or while the ship is on the high seas. Examples

of inventions for which patents in shipbuilding countries may not provide adequate protection would include systems that are predominantly software-based, for example condition monitoring and energy optimisation systems, or other systems which are straight-forward to supply and install on board. Moreover, patents on processes, for example exhaust gas cleaning or ballast water treatment methods, may be infringed only when the ship is in operation. Such patents may be challenging to enforce against a shipbuilder unless a ready-to-run plant to carry out the process is supplied with the ship.

3.2 Protection in territories of operation and major ports

If protection in shipbuilding countries is not possible or patents in such countries cannot be effectively enforced, one is left with the option of targeting infringement in the form of possession and use of the invention, i.e. to pursue shipowners and -operators. There are two potential options to catch unauthorised use: one can seek protection in the territories where the invention is actually used, and/or one can seek protection in the flag state of the vessel (discussed in Section 3.3).

For protection against unauthorised use of an invention on a ship in the territorial waters of a given country, normal national patent protection in that country will suffice. The requirement is that the ship carries out some operation or transport of goods or passengers within that country, since such use can not fall under the temporary presence exception (irrespective of the nationality of the ship). In such cases, the biggest markets could be identified and patent protection sought strategically in a selection of those countries, as one would do for most other inventions. For example, inventions relating to offshore oil and gas production could be protected in countries such as the USA, Brazil, Australia, Norway, and the UK to cover major exploitation areas. Even if a vessel only enters a country temporarily to carry out some operation, the temporary presence exception would not provide a successful defence against infringement since this applies only to ships involved in international transport.

For inventions used on ships in international traffic, patent protection in major ports would be an obvious and very attractive option, were it not for the temporary presence exception. One could, for example, target countries with ports on the main trading routes (such as Singapore, China/Hong Kong, Japan, the EU, and the USA) to obtain very strong protection against infringement, since a large fraction of ships in international transport will visit ports in these countries regularly. With the very broad interpretation of the temporary presence exception applied by the courts, as described above, this strategy is however not viable, since most ships will be exempted. (Only infringement on board national ships could be pursued; see Section 3.3.) If new case law appears, that better defines what use “exclusively for needs of vessel” actually covers, then protection in major ports could be a viable strategy for inventions falling outside the exception, e.g. systems non-essential for ship operation. However, based on the current legal precedence, it is likely that a court will hold most components on a ship to fall under the exception. With strong political objectives to maintain effective international trade routes, it is also unlikely that this situation will change in the near future.

3.3 Protection in flag state

The second option to protect against unauthorised use of an invention is patent protection in the flag state of the ship. A flag state patent can be enforced against a ship independent of its operational purpose; a vessel could obviously not claim defence under the temporary presence exception when visiting a home port. Hence, a technology developer could adopt a strategy of pursuing patent protection in large flag states to obtain broad protection for his inventions.

Under international maritime law, a ship is part of the jurisdiction of the flag state, but the rights granted by a patent normally only apply in the *territory* of the issuing country, i.e. its land areas and territorial waters. (A civil ship on the high seas does not form part of the territory of its flag state.) The use of an invention on a ship in international waters would therefore not breach a flag state patent; only when the ship is in the territorial waters of the flag state can infringement take place. Hence, it is clear that the strategy of protecting an invention in flag states will have a major limitation: a patent can only be enforced if the ship actually operates in the flag state territory. Many ships in international trade may not call in ports of their flag states at all, and formal infringement of a flag state patent may therefore never take place. Moreover, this creates the remarkable possibility that even if an invention is patented in every country in the world, its use on board a ship in international traffic may never formally constitute infringement. This would be the case if the ship never enters flag state territory, since infringement can not take place on the high seas and when in foreign territory the ship would fall under the temporary presence exception.

The Paris Convention was put into force at a time when the nationality of a ship remained simple to resolve; vessels generally had the same nationality as its owners since a ship registry would only allow registration by a citizen of that country. The lawmakers almost certainly did not take into account the possibility of “free choice” of nationality for a ship, which is currently available to shipowners through open ship registries (which allow registration by foreigners). This creates a further problem for maritime technology developers and IP rights owners: a shipowner has the possibility of registering his ships in a country with a weak patent and/or legal system, thereby in practice eliminating the possibility of facing legal action for patent infringement. The situation would be similar to that above in that the temporary presence exception would apply in foreign territories, but in this case even if the ship does enter flag state waters, the patent holder would have no effective means of enforcing his rights.

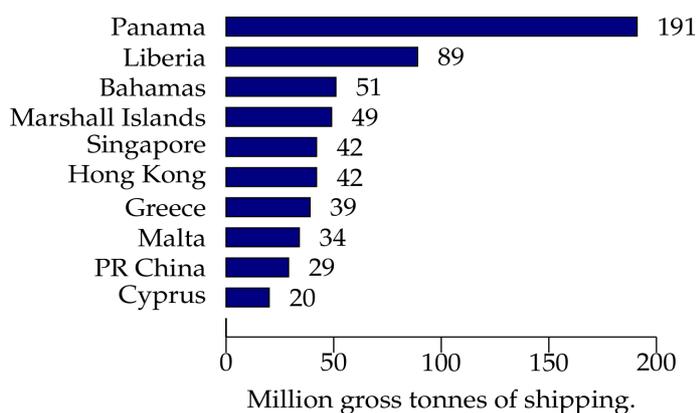


Figure 4: World's largest shipping flags, 2009 [17].

Figure 4 shows the world's 10 largest shipping flags in 2009 [17]. Notable is that at least the top four on this list are countries known for offering open registries, which cannot be said to have a well-functioning patent and legal system, and (with the exception of Panama) which do not lie on any major shipping route. Although these states certainly do have some national law on patents, they have not fully implemented important international treaties on intellectual property. Enforcement of patent rights in these countries may therefore turn out to be very difficult. Hence, for a large fraction of the world shipping fleet, flag state patent protection would not be an effective strategy.⁴

Despite these limitations, patent protection in the flag state could be an effective (and probably the only realistic) strategy to prevent unauthorised use on ships of that country, if those ships regularly visit home ports. A patent strategy that can be adopted to provide some level of protection is to target countries which are (a) large flag states, (b) have large ports, and (c) have a functioning patent system. For example, patenting in Singapore, Hong Kong, and China⁵ would cover a small but non-negligible fraction of the world fleet. A number of the busiest ports in the world are located in these countries, and patents could be enforced against a ship when visiting a port in its flag state. (Since, for example, a Chinese ship going to port in Shanghai could not take advantage of the temporary presence exception if infringing a Chinese patent.) Even though a patent cannot be enforced when a ship is outside the territorial waters of the flag state (which may be the case most of the time), the mere risk that the ship could be impounded when visiting a home port could force the shipowner stop the unauthorised use or to take out a licence.

In summary, flag state patent protection would only be worthwhile in countries with a large shipping fleet and a functioning patent system, and where ships regularly visit home ports. However, for many of the major flag states, covering the majority of the world fleet, this strategy would be ineffective, due to problems of a non-functioning patent system and the fact that ships never enter flag state territory. Considering that the main objective of shipowners seeking registration under convenience flags is to operate under a laxer regulatory framework, the major flag states will not have incentives change their patent systems, since that would make them “less competitive” as a shipping flag. This is underlined by the failure of these countries to implement international treaties on intellectual property, and this situation is therefore unlikely to change significantly in the near future.

4 One issue related to this, which is worth noticing, is the unclear legal situation for ships under Marshall Islands (MI) flag. The Marshall Islands are a sovereign state, but are not party to the Paris Convention. The temporary presence exemption may therefore not provide a valid defence for use of a patented invention on MI ships in another country's territory, since the Paris Convention only requires this privilege to be granted other signatory states. It is therefore possible that legal action for patent infringement against a MI ship could be successful (provided that infringement of a valid patent has taken place).

5 Note that Hong Kong has a patent system separate to that of China.

5 Discussion and conclusions

It has been shown that international regulations aimed to facilitate world trade can present significant challenges to maritime technology developers seeking to protect their intellectual property through patents. The intention of the lawmakers is that national patent rights should not hinder international trade or travel, and courts in several countries have interpreted the law in light of this and have generally not allowed the enforcement of patent rights against foreign ships. Although only *devices used exclusively for the needs of the vessel* are exempted from patent infringement, it appears likely that a court would consider anything except cargo to fall under this definition. As a practical matter, it is therefore probably more useful to interpret the exception to cover *devices used exclusively on the vessel*.

Through the use of open ship registries (in particular “flags of convenience”) and/or by operating a ship exclusively outside the flag state territory, it is in some cases possible for a shipowner to avoid patent rights altogether. A technology developer therefore has very limited means for preventing unauthorised use of his invention on ships in international traffic, which arguably is a weakness of the current international legal framework. Unless ships take part in domestic transport or operations, flag state patent protection will only be worthwhile in large flag states which also have major ports, such as China, Singapore, the EU countries and the USA.

A preferred option in most cases will probably be to prevent unauthorised manufacturing and sale of the invention through patenting in major shipbuilding countries. Such a strategy can be effective for inventions relating to major components which will be supplied from the shipyard, such as the hull design, machinery, and propulsion system. However, for inventions which can be easily supplied to a ship and retrofitted on board after delivery, the inventor may have a challenge securing any protection at all. Among other things, this may include inventions that are predominantly software-based, inventions that are made up of standard components, and patents on processes.

As has been illustrated, securing strong patent protection for new maritime technology can be very challenging. The limited means available to prevent unauthorised use of certain types of inventions should be kept in mind by developers of technology and patent attorneys advising such clients. Although these problems only relate to ships in international traffic (for other ships, normal national patents for the territories of interest can provide effective protection), this situation may reduce the value of “maritime” patents, leading to less incentives to innovate and publish information on new developments. This is clearly undesirable in an industry which will continue to play a key role in the world trade in the foreseeable future, but which needs continuing innovation in order to meet future emissions legislation, achieve reductions in energy consumption, and further improve safety.

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