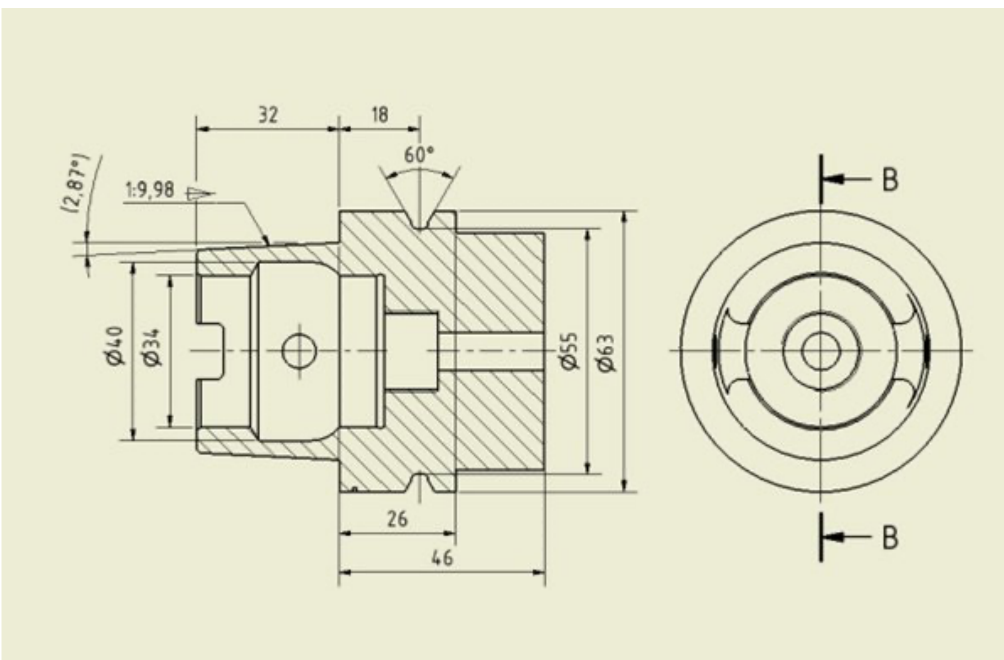
The Importance of Technical Drawings

One seldom-discussed but important aspect of inventing success is having good technical drawings. A technical drawing varies from a simple sketch or layman's drawing in a notebook. While these are helpful in the early stages of conceptualizing, a technical drawing is a much more detailed visual representation intended to "concisely and clearly communicate all needed specifications to transform an idea into physical form", according to Wikipedia.

This becomes important when it comes time to develop a working prototype of your invention, and especially when it comes time to mass-produce it. The crude "notebook" drawings you sketched up yourself won't be accepted or usable by a manufacturer. Without detailed technical drawings that a manufacturer can take into his hands and understand, you most likely will experience serious delays and costly errors. So let's explore in more detail what technical drawings are, how they will benefit you, and how you can attain them.

As noted, the main people who will be creating and using technical drawings of your invention are **engineers**. The main difference between technical drawings and other drawings is the degree of standardization. Rather than simply sketching your invention, an engineer drafting a technical drawing will meticulously draw it out in accordance with industry-wide standards for everything from layout, line thickness, symbols, descriptive geometry, text size, notation, dimensioning and view projections. This means that any similarly qualified engineer can look at your technical drawing and understand exactly what it represents with minimal explanation from you.

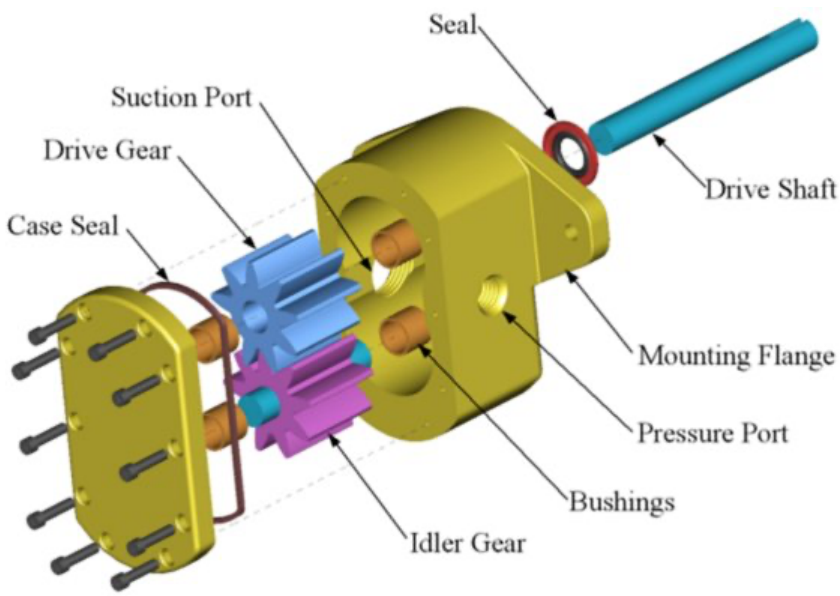
An example of a technical drawing (an engineering drawing, in this case) for a machine tool is shown below:



Engineered drawings such as these unambiguously represent the proportions and dimensions of the invention. Every angle, nook and cranny of the invention is described in terms of length, height, and scale indicators that any engineer will immediately understand.

However, engineered drawings are not the only kind of technical drawings useful to an inventor. Another commonly used drawing is known as the cutaway drawing (shown below). The main purpose of the cutaway drawing is displaying your invention in 3D form – rather than flattened out – but opaquely, so that the inner workings of the invention are still visible. Drafting a cutaway drawing enables an engineer or manufacturer to get a better picture of how the invention should look in its finished state.

Still another kind of technical drawing that often proves valuable to inventors is the **exploded view** drawing. For inventions that contain a lot of moving or inter-locking parts (such as the gear pump pictured below), an exploded view drawing captures the interconnectedness of these components and the exact way in which they fit together to form your completed invention. Without an exploded view drawing, you are left explaining these complicated inter-relationships verbally, which rarely captures the subtle nuances of how it all has to work in practice.



In addition to physically creating your invention, technical drawings come in handy when filing for patent protection. If you do apply for a patent, you will be required to submit what are known as patent drawings (see our article on the subject), that visually convey your invention in much the same ways as you have seen here. Getting technical drawings done early on will be a serious time saver when applying for patent, because you can use these **as** your patent drawings.

It used to be that a drafter or engineer would create these drawings out manually, using drafting boards, protractors, and triangles, pen and paper to get the job done. Naturally, this was a rather error-prone process that did not always convey the object effectively. Today, the whole process of creating technical drawings is much more streamlined.

Using computer-aided design programs like AutoCAD, a skilled engineer can depict your invention on any or all of the technical drawings above with total precision and accuracy.

In addition to AutoCAD, another program commonly used to create high-quality technical drawings is **SolidWorks**. The main benefit of using a program like SolidWorks is that it lets you specify a **feature** (or several features) of your invention and hold that feature constant regardless of other changes you make to the design. Wikipedia offers a practical example:

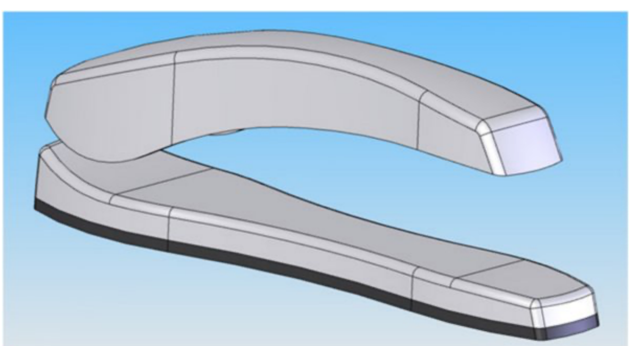
"For example, you would want the hole at the top of a beverage can to stay at the top surface, regardless of the height or size of the can. SolidWorks allows you to specify that the hole is a feature on the top surface, and will then honor your design intent no matter what the height you later gave to the can."

The benefit to you as an inventor should be clear. Beginning from a simple 2D sketch, an engineer can use a program like SolidWorks to draw out your invention with its features (pumps, hooks, handles, or what have you) as the foundation, making changes to the size, shape, or texture while ensuring that the critical features of the invention remain prominent and intact throughout. This, in turn, enables you to visualize what your invention would look like in different shapes and sizes before it physically exists.

SolidWorks also contains **simulation** technology that allows your engineer to see how a certain design would behave as a physical object. (For instance, whether your invention will lose durability at a given size or weight can be gauged using simulation.) Designs deemed problematic or cumbersome are then abandoned on the computer screen, at relatively low cost, rather than after being physically created.

Another helpful feature of SolidWorks (which some other programs have since copied) is the ability to "roll back" through every drawing of your invention that exists. For example, let's say you have ten drawings created of your invention at various stages of its development. Chances are that each of these drawings contains different features, sizes, geometric dimensions and other differences from the drawings before or after it. However, because of the rollback feature, you or your engineer can quickly and easily modify an older drawing in any way deemed necessary without messing up the other drawings.

A typical drawing created with SolidWorks – of a stapler, in this case – looks something like this:



Need technical drawings of your invention?

Idea Buyer LLC recommends Patent Help Now for inventors seeking professionally-crafted, industry-standard technical drawings. Using SolidWorks, PDC's team of experienced engineers utilize a time-tested, five-step process beginning with a basic surface model and ending with a comprehensive technical drawing that a manufacturer can take into his hands and create your invention with. The process typically encompasses 4-6 weeks and involves the following steps:

Step 1 – Engineering/3D CAD Development: The first step involves creating a 3D product surface modeling of your invention similar to the 3D car drawing shown earlier. At this stage, PDC's engineers will also conduct a critical analysis and simulation of your invention's design, looking not merely for what "might" or "would" work, but for the best, most cost-effective design possible.

Step 2 – Structural Analysis: With a professionally designed 3D product model in hand, the next task is to conduct what is known as a finite element analysis (or FEA) on that design. In a nutshell, this involves running a number of simulations and stress tests to determine how your invention (as laid out in the 3D model) will respond to stresses, strains, and reaction forces. Will it break if someone pushes it too hard? Will it hold up under heat? How will it react to repeated use? These and other questions are answered definitively in this stage, as the overall structural integrity of your invention is rigorously tested by PDC's engineers. Your invention will also be assessed in terms of its weight, with an eye toward eliminating needless bulk and size.

Step 3 – Virtual Prototyping: Once your 3D product model has shown itself to be reasonably stress-resistant, a virtual prototype is developed based on that model. Essentially, this involves optimizing the model created in step 1 and validated in step 2 so that it can be created using the most cost-effective manufacturing procedures and materials. The end result of this step (from your perspective) will be an interactive 3D image that you can twist, turn upside down, zoom in or out of and see from every angle in as much detail as you wish. Manufacturers actually **prefer** to receive prototypes in this format because it is easier to rework a virtual prototype than a physical one. It also makes for easier communication between you and the manufacturer.

Step 4: Form Fit Function Testing: All that remains after virtual prototyping is subjecting the prototype to Form Fit Function tests. Very simply, form fit function (or F3 in engineering-speak) encompasses your invention's identifying characteristics. Wikipedia defines each of these as follows:

Form refers to the "shape, size, dimensions, mass and/or other visual parameters which uniquely characterize an item. This defines the "look" of the part or item. Sometimes weight, balance and center of mass are considerations in form."

Fit refers to "the ability of an item to physically interface or interconnect with or become an integral part of another item or assembly. This relates to the associativity of the part in relation to the assembly, or to other parts, and includes tolerances."

Function refers to "the action[s] that an item is designed to perform. This is the reason for the item's existence, which also includes secondary applications."

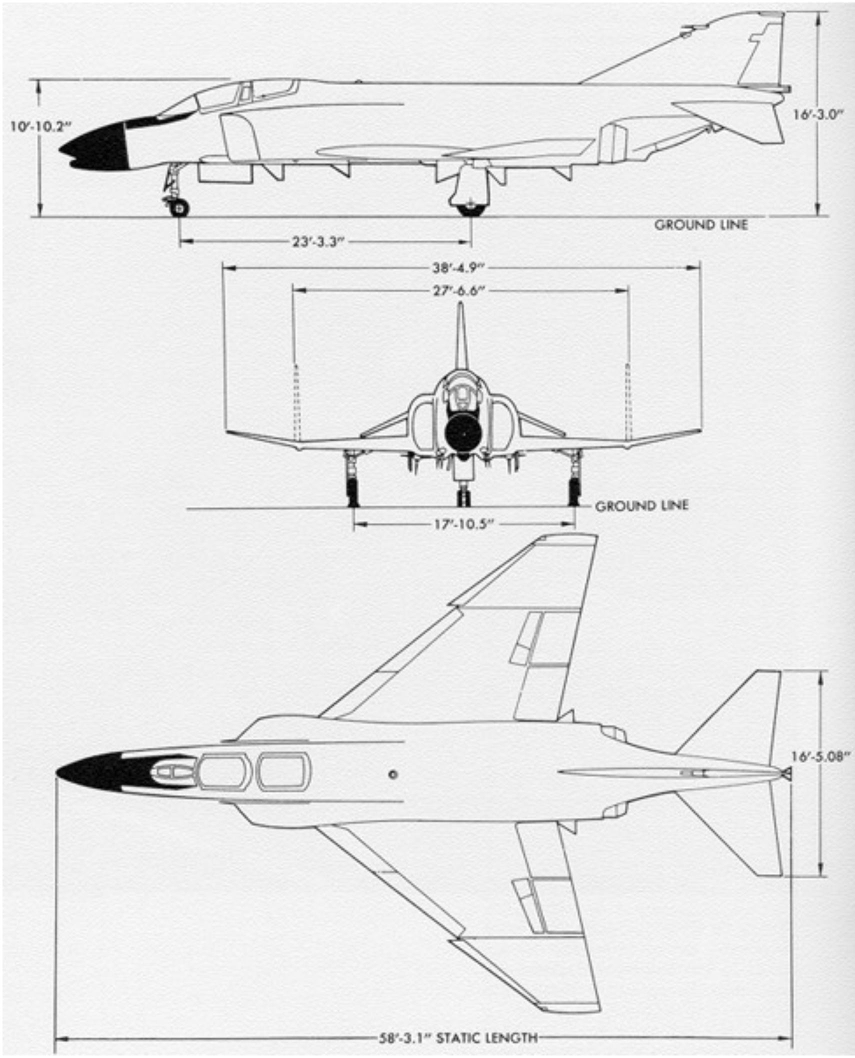
This step, then, involves ensuring that the virtual prototype created in step four includes each of these things and that any manufacturer or engineer can clearly discern them by looking at your technical drawings.

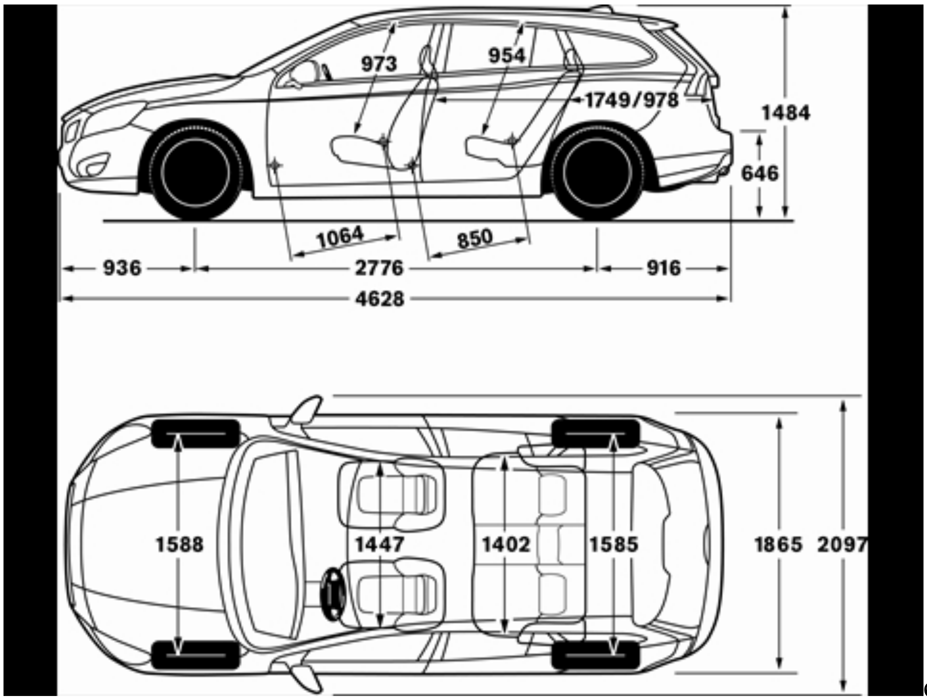
Step 5: Final analysis: When each of the first four steps is complete, a final analysis is performed to ensure that everything has been done correctly, according to standard and without oversights. Loose ends are tied up and the end result is an invention ready to be created by any manufacturer willing to do the job.

A ton of tech dwg images at

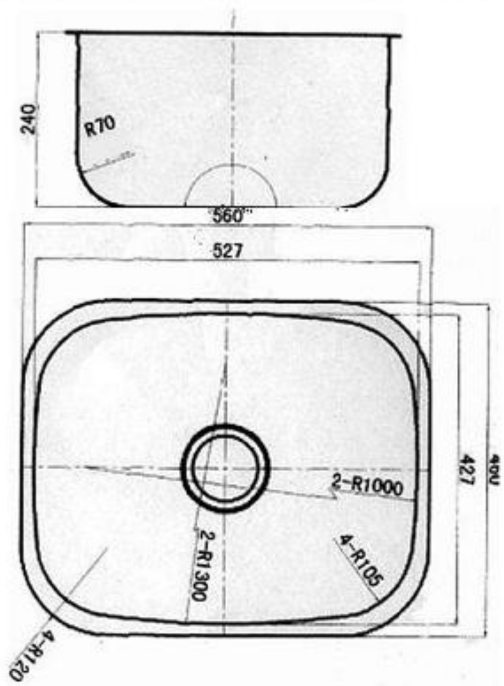
https://www.google.ca/search?q=dimension+technical+sketches&hl=en&client=firefox-a&hs=5nU&rls=org.mozilla:en-GB:official&prmd=imvns&tbm=isch&tbo=u&source=univ&sa=X&ei=qjNOUIDIEYr1qwG_94HYDQ&ved=0CEAQsAQ&biw=1112&bih=1026

read a tech dwg


10'-10.2"
16'-3.0"
GROUND LINE
23'-3.3"
38'-4.9"
27'-6.6"
GROUND LINE
17'-10.5"
16'-5.08"
58'-3.1" STATIC LENGTH



“everything but the kitchen sink” … well ok, here’s a kitchen sink


240
R70
560
527
427
400
2-R1000
2-R1300
4-R105
4-R120