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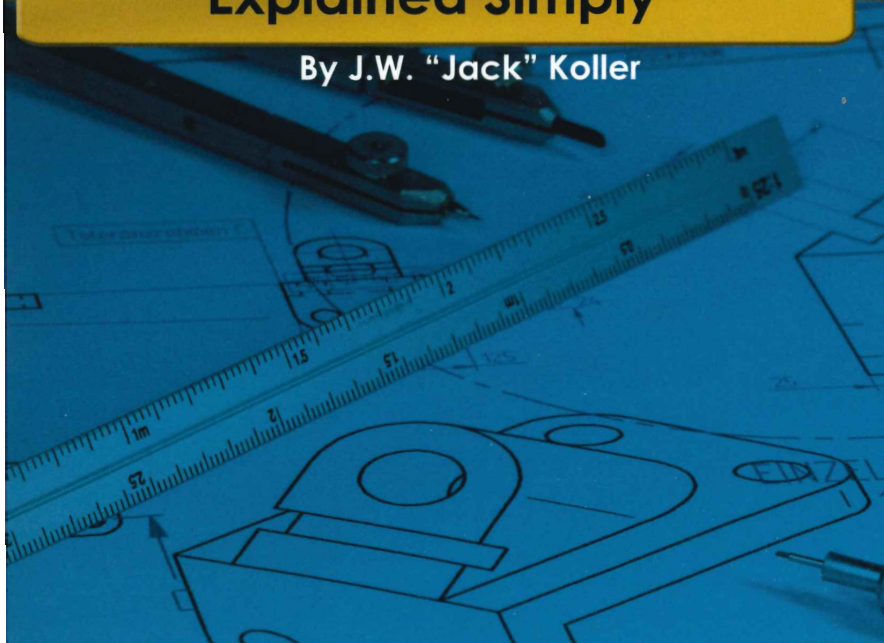
PATENT DRAWINGS

and

SAVE THOUSANDS

**Everything You Need To Know
Explained Simply**

By J.W. "Jack" Koller





How to Make Your Own Patent Drawings and Save Thousands

Everything You Need to Know Explained Simply

By J.W. Jack Keller

HOW TO MAKE YOUR OWN PATENT DRAWINGS AND SAVE THOUSANDS: EVERYTHING YOU NEED TO KNOW EXPLAINED SIMPLY

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We recently lost our beloved pet “Bear,” who was not only our best and dearest friend but also the “Vice President of Sunshine” here at Atlantic Publishing. He did not receive a salary but worked tirelessly 24 hours a day to please his parents. Bear was a rescue dog that turned around and showered myself, my wife, Sherri, his grandparents Jean, Bob, and Nancy, and every person and animal he met (maybe not rabbits) with friendship and love. He made a lot of people smile every day.



We wanted you to know that a portion of the profits of this book will be donated to The Humane Society of the United States. —Douglas & Sherri Brown

The human-animal bond is as old as human history. We cherish our animal companions for their unconditional affection and acceptance. We feel a thrill when we glimpse wild creatures in their natural habitat or in our own backyard.

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The Humane Society of the United States makes a difference in the lives of animals here at home and worldwide. The HSUS is dedicated to creating a world where our relationship with animals is guided by compassion. We seek a truly humane society in which animals are respected for their intrinsic value, and where the human-animal bond is strong.

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Dedication

Any dedication will leave out many people that helped form the thoughts that have been expressed in this book. To them, I do apologize. I must, however, thank those who have been most influential.

I thank my parents for the work ethic they imparted in me.

I thank Robert O'Dell of Central Piedmont Community College for guiding my early interest in this area and introducing me to George J. Soos.

I thank George J. Soos, also of Central Piedmont Community College, for being my teacher, my mentor, my colleague, and also my friend.

I thank Brian J. Hanaway for the phrase "clear and unambiguous" and showing me how that applied to industry.

And I thank Bill Caudle for consistent support.

To them, and the many others, I dedicate this book.

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determines if submitted drawings meet the standards and published reviews in all patent disclosures filed. Though some minor variances may be permitted, this department carefully studies each drawing to ensure it can be easily read and understood. For this reason, it is important that all drawings follow the rules set forth. *These rules are discussed in Chapter 2.*

When is a Patent Drawing Needed?

It is easy to say that every patent needs drawings and illustrations. These illustrations help provide support for the uniqueness of the patent and aid in the quick approval process. There are instances on record where the USPTO refused to grant a patent until sufficient drawings had been submitted. There are three basic rules for the determination of whether or not a drawing is necessary: clarity, complexity, and considerations.

Clarity

First is the rule of clarity, which states that any time a drawing or illustration will add clarity and understanding to the patent disclosure, the drawing should accompany it. Regardless of the complexity of the invention, illustrations and drawings will normally improve the clarity of the claim. Simply think of a common item, such as an inexpensive cell phone. How many words would it take to describe the face of this phone? Would it not be easier to understand if a drawing were included? This is an example of where an illustration will add clarity to the patent claim.

Complexity

Drawings can be used to clarify a complex mechanism or processes. The more complex an issue is, the more likely it will benefit from the use of graphic illustration. Once again, let us look at a simple example. The workings of the mechanical pocket watch are extremely complex. In this small object there are levers, gears, springs, and escapements. To describe how they interact with each other would take many paragraphs of discussion and still would leave the general public with minimal understanding of how these things work. However, the addition of a drawing that shows how the gears mate, where the levers and springs interact, and the placement of the escapement makes the arrangement of these components much more understandable. It is true that the general public still may not under-

stand how the watch functions, but they have a better idea of the complexity of the invention because of the drawing that was included with the explanation.

Design patent considerations

The final rule applies only to design patents. If a design or graphics are important parts of the patent claim, then the applicable design and/or graphics must be included in the patent disclosure. Because this type of patent is filed to protect the design or graphic, it would seem intuitive that the design must be included in the patent disclosure, but this has not always been the case. There are a number of design patents on file in which the applicant did not include an example of the design. Once again, consider the complexity of the simple design. In this instance, consider the trademark for the Hewlett-Packard Company. This trademark is a relatively simple rectangle, with a dark circular center and a stylized HP in the center of the circle. Although this describes the trademark, it would be impossible for anyone to duplicate that design from this description alone. Yet, once the actual trademark is shown, the design and image are easily understood and could be duplicated.

When considering these three rules, you can see that a patent drawing is needed in almost every instance. Whether you are submitting a utility patent or a designed patent, it is important to think in the terms of providing drawings to support the claim. Though you may understand the invention to the point where the drawings are not necessary, you must remember that the USPTO is seeing this invention for the first time. As such, you need to provide adequate information to ensure they understand the function and uniqueness of the invention. This is often best done with drawings.

Will more than one drawing be necessary?

The question then arises: Will the patent need more than one drawing? As the complexity of the invention increases, the need for drawings will increase. With simple inventions, a minimal number of drawings are required. The more complex an invention, the more drawings that are needed to better explain it. And remember, the term “patent drawings” also includes schematics, charts, diagrams, and tables. Very few modern patents are accepted with a single drawing. From the beginning, multiple drawings should be considered, and the number will be determined by the complexity of the invention or process being described.

What should be shown in a patent drawing?

Another way to approach the question of how many drawings are required is to consider what needs to be shown. Obviously the more features that need to be shown, especially in detail, the more drawings and illustrations will be needed. There are many approaches to determining what needs to be shown, but they can best be summarized in a few simple rules.

The primary requirement for illustrations and a patent is that all features that are pertinent or an integral part of the device, process, or design for which the patent is being requested should be shown in full clarity. Although the concept sounds simple, determining which items are pertinent and/or which items are integral is not always a simple task. To better understand this, definitions of these terms, as they apply to patent drawings, are necessary. A glossary of many of these terms is included at the end of this book.

Pertinent to this discussion is that which makes the device or process unique. An example of this would be the comparison between a point-and-shoot camera and a single lens reflex camera. One important aspect of the single lens reflex is that the user sees through the lens that actually takes the photograph, providing the user a preview of what will actually be stored on the media. A second aspect is that the lenses are interchangeable, allowing the user to select the best lens for the photo to be taken. Both of these features need to be shown in drawings or illustrations. If you were trying to obtain a patent for a point-and-shoot camera, on the other hand, there is not as much detail to show because the lenses are not interchangeable, and no preview is seen by the user.

Continuing this example, the first pertinent aspect can be shown with an illustration that depicts the light path through the lens and to the eyepiece for the user. This makes it clear that the user is actually looking through the lens of the camera. To try to properly describe the optical path, the conversion to binary code, and the reassembly of this code to provide an image is nearly impossible. Even when well described, the complexity would be beyond the comprehension of most users. In truth, most users could care less how many times the lens and other components invert the image, yet this is a relevant part of the patent.

The second pertinent aspect is the ability to change lenses. It is very simple to show the camera with lens attached and the lens separate from the camera. By showing the camera with several different lenses, the user can more easily under-

stand this concept. This conveys interchangeability of lenses more clearly than can be done in text format.

Integral, as it is used here, refers to a feature of the process or device that allows it to function. In the example of the camera, a shutter is required to time the length of the exposure. Without a shutter, the camera would not work. Therefore, the shutter is an integral part of the device. Because it is an integral part, and because there are several different shutter styles, it is essential to describe the shutter and how it functions. A drawing can be very useful in helping provide clarity on this issue to the USPTO.

A second use for drawings and illustrations in the patent is to show any detail or information that can help establish the uniqueness of the device, process, or design. For the design process, the detail is generally the design itself. With a process or device, the selection of such detail can be more difficult. The issue is not only which details make the device unique, but also what is the best way to show them. If any doubt exists whether a feature helps establish the uniqueness, it should be illustrated. If there is more than one way to show the detail, show each necessary view. It is always wise to err on the side of providing more information than required when discussing patents.

Because the detail in the example included the fact that it is a digital SLR, we can use it to highlight both a process and a device that should be illustrated. With the process, we would use a diagram to explain how the light that came through the lens was converted into a digital image and recorded on magnetic media. This would not lend itself to mechanical drawing, but can easily be understood through the use of a diagram. On the other hand, the LCD viewer on the back of the camera can be best understood through the use of a mechanical drawing. The drawing would show its size in relationship to the camera, and its location. These two examples point out typical uses of illustrations to document the uniqueness of features.

A Short History of Utility and Design Patents

To understand how the use of patent drawings came about, look at the history of patent drawings and the USPTO. Though much of the process has remained the same since the first patents in the late 1700s, there have been some changes that

useful tools for planning and assisting in documenting the invention. *For more information about the acceptable use of photographs, please see Chapter 4.*

Color photographs

Color photographs have a dual requirement. First, they must meet the requirements for a color drawing. A petition must be filed and granted, and the amendment to the specification must be inserted in the disclosure. In addition, they must meet the requirements for a black-and-white photograph. It must be the opinion of the USPTO that the color photograph is the only feasible means of providing illustration of the claimed invention. Therefore, acceptance of color photographs in a patent disclosure is extremely rare and should be avoided, unless it is the only means by which meaningful illustration can be provided.

Specific Rules

The specific rules for patent drawings cover a number of details. In each instance, these rules will be given with an example to reinforce the rule. Although minor variance from these rules may be accepted, it is better to adhere to them and assure that your drawing does not require revisions or that it is rejected.

Labeling

One of the primary areas of concern is labeling. In part, this concern comes from vague wording in the standards for labeling a patent drawing. For example, one section of the standard states that the drawing should be identified with the title of the invention, the inventor's name, and an application number. Another location in that same standard contains a seemingly contradictory statement. This second statement prohibits names or identification within "sight" of the drawing.

The key to this contradiction is the word "sight." Within the realm of patent drawings, "sight" indicates the usable portion of the page or sheet. The usable portion of the page is the area of the page that exists after the minimal, required borders are created. It is in this area that there should be no identification of the invention or the inventor.

In truth, when these two statements are understood, we see that the invention name and the inventor's name should be centered in the top margin of the sheet. If a patent, or docket, number has been assigned, this may also appear in that margin, but in the upper left. Once a patent has been granted, the date will appear

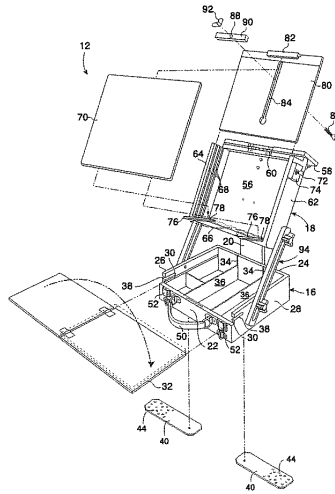
at the upper right of the sheet. This information may be given in text no less than 3.2 mm wide and 5 mm in height.

Aside from the identification of the drawing, labeling is done to identify features of the invention. All labeling is to be done neatly and legibly with a minimum text size of 0.32 cm, or approximately one-eighth of an inch. In addition, no parentheses, brackets, or quotes are permitted except when an exploded view and another drawing appear on the same sheet. In this case, the exploded view drawing must be enclosed in parentheses. All text should be in the same orientation as the view on the page so that the reader does not need to turn the sheet to read the text. The text must also be arranged in such a manner that it follows the general profile of the item shown.

Only the English alphabet may be used, with the exception of standard mathematical and engineering symbols normally shown in an alternative alphabet, such as the Greek alphabet. When these alternatives are used, they should follow all other rules for text. Only items specifically mentioned in the body, or text, of the disclosure should be identified with reference characters on the drawing. When a single portion of the invention appears in more than one drawing, particularly on different pages, the same reference identifier should be used for that feature. This identifier should be used throughout the entire patent disclosure.

These identifiers, whether alphabetic or numeric, should be placed in logical locations near the feature they are meant to represent. Unless absolutely necessary, they should not be placed on the illustration or the drawing, but rather near it. Likewise, these identifiers should not interfere with any line work of the drawing. Should it be necessary to place text on the drawing or in a shaded or crosshatched area, that shading should be interrupted immediately adjacent to the reference indicator, and the indicator should be underlined.

Though these rules may seem complex, we will look at them as we develop our examples. In actuality, they are simple and easy-to-follow rules.



"The proper use of lead lines," courtesy of a. b. Johnson, Inc.

Paper specification

The concept of sight was introduced in the previous section, but it was not truly defined. The sight is the area of the sheet minus the required margins. The standard document size in the United States is 21.6 cm by 27.9 cm (8 ½ in x 11 in), so that size will be the only size discussed within the scope of this book. The size of the margins remains constant regardless of which sheet size is used.

The requirements clearly state that the following margins must be used:

- Top margin = 2.5 cm (1 in)
- Left side margin = 2.5 cm (1 in)
- Right side margin = 1.5 cm (½ in)
- Bottom margin = 1.5 cm (½ in)

On the standard sheet this results in a sight that is 17.6 cm wide by 24.4 cm high (6 15/16 in x 9 5/8 in).

In addition to the sizing requirements, the sight should be free of frames or other lines that indicate the working area. However, small targets, such as cross hairs, may be placed on opposing diagonal corners of the area.

Views

The standards for patent drawings address multiple types of views. For now, only a brief definition of the views and their uses will be given. The discussion here will be more in the frame of what is both permitted and expected. *Chapter 3 will focus on the creation of these views.*

The primary rule for views is that the drawing, or drawings, must show as many views as necessary to describe all of the pertinent features. This is the single most important rule when it comes to patent drawings and will be repeated and stressed throughout this book. If there are not enough views to show all the detail, the patent will be denied. If there are too many views, time was wasted in the creation of the drawings. The trick is to find a balance between those extremes.

General views

General views are considered to be those that are commonly used to show the invention. These are almost always mechanical drawings of the device. The types of general views can be plan, elevation, section, perspective, detail, exploded, and partial views. Included in this grouping are other types of graphics such as charts, diagrams, waveforms, flowcharts, and schematics that are necessary to fully describe the invention. Each type of view or graphic has rules governing the way it is drawn.

Ideally, related views should be grouped together in a logical manner and on a single sheet when possible. *This logical manner will be discussed in detail in Chapter 3 and is the standard for drafting in the United States.* The views must not be on the same sheet of the disclosure that contains text pertaining to the item being patented. Views must be placed as close to each other as is practical, but in no instance should they encroach on each other or overlap. Centerlines, or any other type of line, should not connect views unless the graphic is that of a waveform. With waveforms, a dashed line may be used to show relative timing of the forms. Finally, views should be arranged so that they are viewed from the bottom of the sheet when possible. Should it be necessary to rotate the views, the proper viewing angle will be with the right edge of the sheet now located at the bottom.

Exploded views

Exploded views are also common in patent drawings. An exploded view, sometimes referred to as an assembly drawing, shows the relationship of parts and components within the invention. They should be used only if this relationship is a factor for the patent, or if the user will need to know this relationship to prop-

erly use the device. If the exploded drawing is the only drawing on a sheet, it may be drawn without brackets surrounding it. However, if the drawing is on a sheet with another drawing, it should be enclosed within brackets to separate it from the other drawing. A common misconception is that exploded views must show the entire device and all its components. This is not necessary. Exploded views may show only those areas where the relationship of the parts is important or may need clarification.

Partial views

When an exploded or general view does not show the entire unit, it is considered a partial view. Partial views are used when the invention is of such size that a single drawing, confined to the sight of the sheet, will not provide adequate detail to properly describe it. In such instances, the invention may be broken into partial views and shown over multiple sheets or multiple views on a single sheet. There are two other conditions for the use of partial views. The first is that if multiple sheets are used, they must be shown on consecutive sheets in the disclosure. Second, they must also be done in a manner that does detract from the clarity of the illustration.

For example, you would not want to place two adjacent views of a partial drawing ten sheets apart in the package. This would require the examiner to leaf back and forth through the package to relate features from one drawing to the other. Likewise, you would not want to split a detail of the invention so that only a portion of it appeared on each of the consecutive sheets. This would provide a loss of clarity. In general, it is never acceptable to divide a drawing in a manner that a detail is split between sheets or views.

Though it is possible to show partial views on a single sheet, it is more common that these views exist on multiple sheets. When this is the case, they should be drawn in such a manner that they can be placed together to show the entire object. There should be no overlap between the drawings, nor should there be any portion of the drawing not shown even though it contains no significant detail. The second drawing should begin exactly where the first one ended. Regardless of whether the partial views are on single or multiple sheets, a reduced scale drawing must be included to show the relationship of the partial views. It is common that this reduced scale drawing appear on either the first or last sheet of the partial views.

Partial views may also be detail views. A detail view is a partial view shown at a larger scale than the main drawing. This is done to provide more clarity for the

detail without showing the entire drawing at the enlarged scale. Such views must be uniquely identified, as should the region of the main object from which the detail has been taken.

Sectional views

Sectional views are views that show interior detail of the device. This detail is shown as if the item has been cut away and the inside is clear for everyone to see. These views are used in patent drawings only when the interior detail is a feature that helps make the item patentable or is otherwise important for the overall understanding of the device.

When using section views, the location from which the section has been taken must be clearly identified on an adjacent view. This is done with a cutting plane line. Drawing a cutting plane line, with the proper width and style at the location of the cut, is essential. The line should be terminated with perpendicular lines indicating the direction of viewing. At the end of each perpendicular line closest to the drawing, an arrowhead should be used to further reinforce the viewing direction. Each arrowhead should be identified with the same Roman or Arabic numerals that would correspond to the labeling of the actual section view. These letters must be underlined to designate them as section identifiers and not as reference indicators for which the lead line has been accidentally omitted. Each set of identifiers must be unique, and the same reference indicator may not be used for multiple sections and cutting planes.

In the section drawing itself, the material or materials that are shown as if cut must be indicated in a manner that indicates the type of material. The goal is to make the section drawing easily understood. By providing this material indication, the differentiation between the outline and the sections is clearly made. The technique used is crosshatch, or section line, for these areas. The lines for this are drawn parallel to each other and spaced according to the size of the area being shown. Different types of section lines are used depending on the material that is shown as a section. *Each type of material has its own pattern of hatching, which is covered in Chapter 3.*

All hatching should be done at an angle to the outline of the sectioned item. The spacing of the hatching will be relative to the size of the components or areas. Larger areas will have hatching that is spaced farther apart than smaller areas. When two or more adjacent areas are of the same material and approximately the same size, the angles for the hatching must be varied from area to area to clearly identify each as unique. Though 45 degrees is the preferred angle, it is often necessary to use an alternate angle. This can happen when multiple sections are

adjacent to each other or when the exterior of the device happens to be close to 45 degrees.

Alternate position views

Alternate position and modified form views are also used in patent drawings. Alternate position drawings are used to show relative movement of parts. Rather than create multiple drawings showing components in different locations, a single drawing may be used with the alternate positions shown in a phantom line style. Modified form views are used to alternate forms of construction and each view must be shown in a separate drawing. These types of views should be used only if necessary to provide clarity to the disclosure.

Front-page views

The last view to discuss is the front-page view. Discussion of this view has been saved for last, because it can be any one of the above views. The front-page view is shown on the front page of the patent disclosure and should be executed in such a manner that it conveys the overall purpose, or appearance, of the item that has been submitted for patenting. Though applicants may simply identify which of the illustrations they would like for the front-page view, it is more common to prepare a view and place it at the front of the disclosure even if it is nothing more than a copy of one of the drawings used in the disclosure.

View orientation and relationship

The view orientation is also important in patent drawings. As mentioned before, in the preferable orientation, all views and labeling can be clearly read when holding the page in an upright position. Should the width of the part be such that it will not fit within the sight of the sheet, the sheet may be rotated 90° so that the normal top of the sheet is at the right of the drawing. Regardless of how the sheet is turned, all text must read from the same orientation.

Within the sight of a single sheet, multiple views may be used. Care must be taken that multiple views do not overlap or touch each other. A minimum amount of space should be left between the views to assure clarity. If labeling each view, or components in a view, additional space to accommodate labeling must be allowed. The overall arrangement must be neat and legible above all else.

Scale

The actual scale of the drawing is not important. The rule governing the scale of the drawings is that it should be as large as possible to show adequate detail, while remaining in the sight of the sheet. If a scale small enough to fit within the sight is too small to show detail, then partial views should be used at the smallest scale that permits clarity of the pertinent details. When it is reproduced for the final patent document, it will be reduced to approximately two-thirds the size submitted. Therefore a scale indicator, such as 1:2, must never be given.

Shading

In patent documents, shading is used to show depth. Shading should be used if it does not reduce the legibility of the drawing and if it increases the clarity of the invention. Typically, shading is used on round, cylindrical, or conical items, though it has also been used on flat surfaces. Shading should be accomplished with thin parallel lines spaced at appropriate distances, using as few as possible to convey the idea. Shading should never be solid black. The only time an area of solid color is permitted is with bar graphs or similar non-mechanical drawings.

Graphic Symbols

Graphic drawing symbols are also accepted in patent drawings. These symbols may be used when appropriate to clarify the drawing. Any symbol used in the drawing must be adequately identified in the disclosure. If the symbol is an industry-standard for a known device an explanation of it is generally not required. Nonstandard symbols may also be used, but they require advance permission from the patent office and must not be likely to be confused with standard, conventional symbols.

Legends

Legends should only be used when necessary. Any legend used should be short and descriptive. The most common revision requested by patent examiners is the request to add a legend for clarity. When the author of the patent disclosure opts to use a legend, it is subject to the approval of the patent office. Because legends are the most common revision requested, it is important to look at the drawing to determine if someone not familiar with the device can understand what is being shown. If they can, a legend is not needed.

Lead Lines

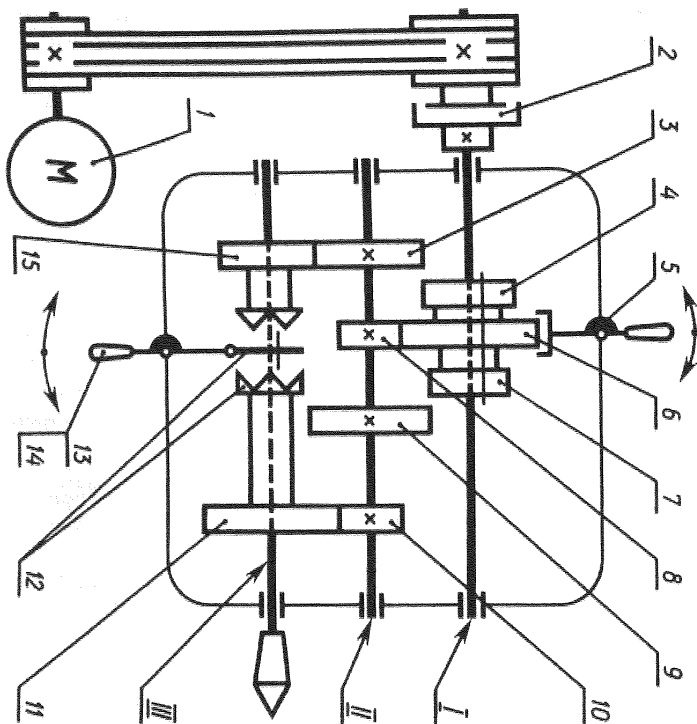
Lead lines are thin, dark lines that connect a reference identifier to the feature it references. These lines are required for each reference character shown on the drawing. The lines may be either curved or straight and should be as close to the reference character as possible. Only one type of lead line should be used throughout the disclosure. If curved lines are used in one drawing, they must be used in all drawings. It is not permissible to mix straight and curved lines. Lead lines may terminate with arrows touching profiles of the drawing, but never when the lead line is touching a surface. In addition, lead lines must not cross each other and their reference indicator should never be underlined.

Arrows

The use of arrows is permitted in patent documents, and serve one of three functions, if used. In a drawing showing alternate positions, arrows are used to indicate the direction of motion. If the arrow is shown on a lead line and it touches a line that indicates the surface on the part, then it indicates the direction of viewing. The final use is a freestanding arrow to indicate a section or portion of the drawing.

It is very important that these standards be observed. Any deviation from them could lead to the request for a revision, or even rejection, of the patent.

The concepts of these rules have been presented in this chapter. *Chapter 3 will provide many of the details and instructions for using these items with the standards that govern the proper creation of a mechanical drawing.* That standard is ANSI/ASME Y-14 M 2009, which is the joint standard issued by the American National Standards Institute and the American Society of Mechanical Engineers.



location is not required. This is all done electronically, and the scale is guaranteed to be the same.

In addition, multiple copies can be made with virtually no extra effort. Most systems permit the users to specify the number of copies to be made, or allow them to continue copying the items until they indicate completion of the copying process. The result is less copy time required than with the manual method and, hopefully, a quicker filing of the patent.

Still, the most important consideration is the overall appearance of the drawings. It is much easier, especially for a new drafter, to create a professional-looking drawing with a CAD system than it is to do this manually. True, more practice may be required for one unfamiliar with the personal computer, but the time is well worth the effort. Professional-looking drawings are more easily read and therefore more readily accepted by the USPTO.

Also, the probability of requiring revision is greatly diminished when using CAD. This is due in part to the fact that there are no physical erasures on a CAD drawing. This eliminates the problems of incomplete erasures, thinning of the paper, and graphite or ink smudges in areas adjacent to the erasure. All changes are made on the monitor instead of on paper. The result is a sheet that looks perfect.

CAD systems also reduce the cost of the medium used. With a modern computer and printer, high-quality prints can be made on bond paper rather than the more expensive vellum and Mylar. Because erasing is not required, a less expensive medium is acceptable for the process.

One of the greatest areas of concern in manual drafting is the lettering of text and notes. Though most people can quickly learn to draw lines to the proper style and width, lettering takes much more practice. For those just beginning technical drawing, the lettering of simple titles and legends can often take as long as the physical drawing of the part. In addition, text for new drafters is rarely uniform. The CAD system allows anyone to quickly and uniformly create professional-looking text.

CAD Tools

As with the traditional drafting method, there are required tools for the use of CAD. The most obvious and important is the computer.

At one time, the personal computer used for CAD had to be specially configured for the task, with extra processing power and extra memory. Most current, off-

the-shelf computers will run the majority of CAD programs. The programs that require more computing power than these computers should be avoided, because they are overly expensive and have features that will never be used in the patent drawing process. When selecting the proper computer, it is essential to know the software requirements. Therefore, software selection should be done before, or at the same time as, the hardware purchase.

From experience, it is best to seek a computer that has as much memory as the buyer can afford, a quality video card, and as large a monitor as financially feasible. Money spent on these items will be repaid in the time saved during completion of the drawings. Other bells and whistles, such as audio systems, huge hard drives, and super processors are niceties, but do not benefit the CAD process.

Computer memory is important because it is much faster to retrieve information from memory than from a hard drive. The quicker the retrieval, the quicker the screen updates and the less the user waits for the drawing to change. Most systems come with adequate memory to display a full screen's worth of data, but because the drawing often exceeds the size of the screen, data adjacent to the current screen may be required. If the system has enough memory, this can be displayed almost immediately; otherwise, the information will need to be read from the disk drive and displayed on the screen. The time required is usually only seconds, but if the process repeats throughout the day, time wasted becomes significant.

One thought is to buy the largest monitor available. This will help to a certain degree, but clarity is as, if not more, important than size. A large monitor that is not clear is much harder to work on than a small, yet clear monitor. The video card controls the clarity of the information displayed. The specifications for this card include the number of pixels (picture elements) that can be displayed both horizontally and vertically. There are other specifications, but these are the numbers that control the clarity of the screen.

Not many years ago, in the mid 1980s, a video card that produced 1024 x 768 pixels was considered excellent. Today, this is the very minimal amount that should be considered. Modern systems often provide video in the range of 1920 x 1536 pixels. The higher the numbers, the more clarity the system will have, providing the monitor selected will support that display rating.

Most monitors support multiple pixel formats, and every monitor currently on the market supports the 1024 x 768 pixel rating. Knowing the maximum pixels that the video card will produce allows for the selection of a monitor that produces the best clarity. Only after selecting a monitor with suitable clarity should size be considered.

Monitor size is important. The larger the size in combination with a high pixel display rating, the more of the drawing that can be seen at any time. This means that switching to other parts of the drawing is required less frequently, which saves time in eliminating screen, or monitor, redraws. Again, the speed at which those redraws occurs is based upon the amount of memory available.

These three components determine the speed of the computer and all must be considered when purchasing a new computer. Generally, any package sold will be adequate for the majority of CAD systems. If there is any weakness in a package, it is usually in the amount of memory, which can be increased at a minimal cost.

The final factor in the selection of the computer should be the consideration of other uses for the computer. Although the computer may initially be purchased for CAD, it could be used for other tasks. Consideration of office tasks, such as word processing or creating spreadsheets can be ignored, as they require very little computing power. Databases, graphics, and gaming are the major specialty tasks that should be considered. When buying a new computer, it is wiser to spend more money on one comprehensive computer than to buy multiple computers for multiple tasks.

Other than the computer, a quality printer is required for CAD. Either an ink jet or a laser printer will be suitable for the task. Both have advantages and limitations that should be understood before the purchase of either.

Ink jet printers are the standard for homes and small businesses. They work by spraying extremely small droplets of ink onto the paper. The amount and location of the ink are controlled by a small computer built into the printer. Typically, ink jet printers produce a resolution, or clarity, of 300 to 600 dpi, or dots per inch, though some systems are now delivering 1200 to 2400 dpi. This means that, for a line one inch long and a single drop wide, a minimum of 300 to 600 dots will be sprayed. The result is an extremely sharp and accurate image. Even at the low end of the scale, the work is more than adequate for a patent drawing.

The price of an ink jet printer is a major advantage. Units capable of producing high-quality drawings can now be purchased at discounters for less than \$50. These units have the same output quality as the more expensive units, but lack other features. If the printer is being purchased primarily for printing patent drawings, then the least expensive ink jet printer should be considered.

However, there are two disadvantages of ink jet printers, regardless of price. The first is that actual ink is being used. Although many manufacturers have statements indicating that ink will not run if it comes in contact with water once dry,

the statements are usually misleading. Wetness can ruin any ink jet print. Use of special inks and papers will minimize this, but it cannot be totally eliminated.

The second disadvantage is the cost of the ink and its packaging. All ink jet printers use ink cartridges to hold and dispense the ink. These cartridges are reasonably sized plastic containers that hold small quantities of ink. Based on the price charged for these cartridges, ink prices for most ink jet printers are more than \$100 per gallon. In some instances, purchasing a new printer that already comes with cartridges is less expensive than buying the replacement cartridges.

Still, the overall cost of the ink jet printer is low. Purchasing this printer should be the first choice if the major use will be printing moderate quantities of drawings and other business documents.

Laser printers should be considered if large quantities are needed. Speed is the laser printer's greatest advantage. These printers can produce pages at speeds up to ten times faster than ink jet printers. Because the number of drawings in a patent is not sufficient to justify such speed, consider them only if other high-volume work will be performed.

Laser printers also offer the advantage of fusing ink to the paper. With this fusing process, the printers eliminate most problems associated with getting a sheet wet. Depending on the brand and the completeness of the fusion, the result may be totally water resistant.

The cost of these units has rapidly decreased in recent years. Black ink laser printers are now available for \$100 or less on sites such as www.globalcomputer.com, where a LaserJet P1006 is \$89.99. Color units, like the Okidata C550n Color LED Printer are more expensive, but can be purchased for less than \$200 on www.globalcomputer.com. However, consider full-color units only if they will be used for other purposes, because patent drawings must be submitted in black and white.

The main disadvantage of a laser printer comes in the toner cost. Depending on the printer, the cost of a single color can be several hundred dollars. These expenses, plus the occasional replacement of the imaging drum, make laser printers more suitable for businesses than for individuals.

As with a computer purchase, consider other uses of the printer before buying one. If these include printing photographs, color is a must and a higher resolution should be considered. If permanency is desired, a laser should be the top candidate. It is better to spend more money initially to prevent purchasing a second unit within a short period of time.

A complete system of computer, video card, monitor, and printer, all suitable for patent drawings, can be purchased for about \$600.

The final required item is CAD software, an area with incredible disparity in pricing. Programs capable of producing quality patent drawings can be downloaded for free from the Internet. At the same time, packages exist that produce suitable drawings, but cost several thousand dollars. *A table in Appendix A gives information on some of these packages.* A discussion of what is necessary and what is not follows.

The ability to draw and manipulate images on the screen and send them to a printer is a necessity. Although this discussion focuses on CAD packages, which produce the electronic version of a technical drawing, other packages may be used. The approach used depends on the person creating the drawings. Those with good skills can also effectively use computer-drawing programs.

The inclusion of engineering analysis tools is not necessary. These may be nice during the design of the invention, but they are not required for the patent drawing. The details necessary for manufacture are typically not part of the patenting process. Therefore, packages with such features contain more than necessary to create the drawings and cost thousands of dollars.

When deciding on a package, consider first whether to work in two or three dimensions. Life is a three-dimensional process. Traditional drafting is a two-dimensional process that conveys three-dimensional information. CAD systems can provide either two- or three-dimensional designs. Although the trend is to use a three-dimensional system, many objects do not lend themselves to modeling, which is the common term for working in three-dimensions. In addition, the cost of the software is typically more expensive and the training and/or learning curve is much higher than that for two-dimensional systems.

Two-dimensional CAD packages can be obtained at reasonable prices, and have all the features necessary to electronically produce a technical drawing. For the electronics and computer programming fields, the two-dimensional CAD is the logical choice because most drawings are diagrams. Electronics rely on schematics, and computer programming relies on flowcharts. Both are two-dimensional by their very nature.

On the other hand, mechanical, or physical, items tend to be three-dimensional. No parts or devices in existence have only two dimensions, though all can be properly represented in a two-dimensional manner.

Other than its reasonable price, two-dimensional CAD packages are considered easier to use and require less practice and training, thus the basis for their appeal for people new to CAD and the entire drawing process. However, true two-dimensional CAD programs are becoming a rarity and are often done with two-dimensional functions of a three-dimensional package. The majority of all programs available in today's marketplace feature some three-dimensional capability. This is deemed necessary as a selling point, but, as pointed out previously, three-dimensional models are not necessarily the best choice for all objects.

CAD has moved into the realm of three-dimensional design. Virtually every program on the market has three-dimensional capabilities, but these capabilities are not all equal. To understand the differences, it is necessary to know a little more about three-dimensional drawings.

Types of Three-Dimensional CAD Drawings

There are two general types of three-dimensional drawing in CAD: wire-frame and solid models. Wire-frame drawings consist of a series of three-dimensional lines linked together to form faces and features. They have no substance; they are simply lines in space linked together. Confusion as to what is being shown occurs when they are displayed, so hidden feature suppression is used. This feature, which may have different names based on the system being used, "turns off" lines that are behind the closest features, thereby emulating a solid component.

Solid models

Solid modeling uses solid shapes, which are represented by lines at edges and features. The appearance on the monitor may seem identical to other software, but how these items are created and their properties are extremely different.

CAD solid models are primitives joined together to create a final object, or shapes that are extruded into a third dimension. Primitives are computer-created geometry, such as cubes, spheres, cones, and tori, which can be added and subtracted to each other to create an object. Because the computer generates the basic form, the user need only supply sizing and location.

Another advantage of solid modeling in patent drawing is the ability to assign material properties. This allows the computer to automatically select the proper section lining for any material shown, thus saving time and ensuring accuracy.

Steps to finalizing your drawings

- Review all drawings for detail, neatness, and clarity.
- Determine if there are any unnecessary drawings, or if there are drawings still needed.
- Carefully label all drawings, with special attention paid to the USPTO requirements for labeling.
- Decide if shading is required, and if so, make sure the shading meets the USPTO requirements.
- Review all the drawings again for compliance with USPTO rules and the ANSI/ASME standards.
- Ink the drawing only after all checks have been made.
- High-quality laser copies may be used in lieu of inking.
- If the drawing is to be traditionally inked, follow the “order of inking.”
- CAD drawings should be created at the proper sheet size on a good quality paper.
- Drawings and illustrations should be placed logically in the disclosure and not in a separate section.
- When submitting your disclosure, assure all the required fees are included.
- If changes are required, understand the changes, their reason, and the date by which they must be completed.

Review Your Work

The first step of marrying the drawings to the patent disclosure is to review the drawings and your notes. This review should be done after all the planned drawings have been created, and preferably several days after the last one has been completed. This lapse in time is essential so that when the drawings are reviewed, the reviewer sees what is there, and not what was intended to be there. If the review is too close to the time that the illustration was drawn, there is a tendency to “see” what was intended and not what was actually drawn.

The reviewing is done in several stages. At each stage only one factor is considered. Although this may seem unnecessary, it is a proven manner of checking the drawings. Very often items that were overlooked in earlier reviews, for that specific item, are suddenly spotted when reviewing for other factors.

Do the drawings provide all detail necessary?

The first, and foremost, stage of this review must be to determine if all the features that make the product truly unique have been illustrated. Remember, the entire purpose of the drawings is to enhance the patent disclosure by providing graphic representation of these details.

The best point at which to begin is with the original notes. Each note should have represented a detail, or aspect, of the invention that could be clarified with the use of an illustration. Without examining the drawings, check if all the drawings planned have been completed, or if it has been determined that they were not actually needed.

Once this has been completed the drawings should be examined, one by one, for the details indicated in the notes. Have all the details been shown? Any drawings that fail this question should be put aside for now and will be further reviewed after all the drawings have been examined.

After all drawings have been reviewed, look again at the actual invention. Look at it from every conceivable angle. Determine if there were any details that the notes did not cover. If so, make a new note and place it with the drawings that have been put aside.

If there were drawings that were put aside, these should now be examined to determine what details were missed or which were unclear. In most instances, this will require a different projection, a detail, or even an exploded view drawing to be created. A note, in light pencil, should be added in the margin of the drawing as to what type of new drawing is needed, but no new drawing should be created at this point. All new drawings should be started only after reviewing all existing drawings, because it is very possible that other drawings will fail for other reasons.

Are the drawings neat?

Neatness is the second most important factor in a patent drawing. If a drawing is technically excellent but there are smears, stains, and incomplete erasures on the drawing, it is not a good drawing. The drawing must be both accurate and visually appealing to be a successful patent drawing. Drawings that are not neat should be set-aside until all the drawings have been reviewed for neatness.

If there are drawings that failed the neatness criteria, they should be examined more carefully. First it should be determined if they can be cleaned up enough to be visually appealing. If they can, this should be done immediately. Any incom-

plete erasures should be completed, and any smears removed if possible. In most instances, a stain will make a drawing unusable. If there are stains on the drawing, it should be moved with those that must be redrawn to better emphasize details.

If the drawings have been created manually, and later planned to be inked, some of these items may be overlooked. But, as you will learn later in this chapter, if the drawings are properly drawn and meet all the criteria covered in this section on reviewing the work, it might be possible to shortcut the inking process. This depends, entirely, on the quality of the drawings. Once the review for neatness is complete, the drawings should be examined for clarity.

Are the drawings clear?

Clarity is sometimes confused with neatness. Although a drawing that is not neat is very often not clear, very neat drawings can still be unclear. Clarity is the aspect of making the detail readily understandable. It is possible to draw a detail accurately and neatly, but in a manner that makes it hard to comprehend. Such drawings are not clear.

It is very hard for the inventor of an item to determine the clarity of a drawing of that item. The inventor already knows the intricacies of the details of the item. The inventor's mind automatically understands them, regardless of how they are shown on paper. If possible, clarity should be determined by another persons — a spouse, a relative, or a trusted associate. This can raise the issue of security, but it is usually necessary to assure the clarity of the drawings.

Any instances where the observer cannot explain the function and purpose of the detail shown should be put aside for modification or redrawing.

Are there drawings that are not actually required?

Ideally the initial notes should have determined this before drawing, but this must be reviewed. Although providing extra drawings is not prohibited, it does give the patent examiner more information to study, and with more information there is added chance of error, contradiction, or ambiguity. The best approach is to supply all the information required one time, and only one time. Brevity is an asset when submitting a patent disclosure.

With the drawings that might require redrawing clearly marked, all the drawings should be assembled once more. If possible they should be spread out on a large surface where all of them can be viewed at the same time. Once arranged in this

manner, it is easier to determine if there are drawings showing the same feature, possibly from different angles, which are unnecessary. Drawings are unnecessary only if an adequate level of detail is provided in other drawings.

A possible exception to this is the cover drawing. If a drawing of the complete invention was not included in the patent disclosure, one should be included for the cover. This is not a firm requirement, but a common practice, because it best describes the overall appearance and/or function of the invention.

It is often the practice to show unique features from multiple angles. This is a good procedure providing that new information is gained from the multiple angles. If the same information is simply repeated, without any clarity being added, then one, or more, of the drawings should be eliminated. Any drawings that are judged to be a duplication of features should be marked and set aside.

Are there still drawings that need to be created?

This may sound very much like repetition of the first item and basically it is. The need to show all features and details must be paramount; therefore, this point is worth repeating.

Take the drawing in hand and go to the invention. Look at the invention again and check the drawings to assure that all the features have been shown in significant detail to fully explain and clarify the invention. If there is any aspect missing that could be clarified with a drawing, a note should be made of that aspect.

The review is now complete. In most instances there will be drawings that need to be modified, new drawings that need to be created, and a few drawings that are not required. This is normal, especially for the first patent application.

Any drawings that need to be redrawn should be done at this time. If time permits, once these drawings have been completed, they should be set aside for a week or longer. Because such time is usually a luxury that does not exist, extra effort must be given as the new drawings are subjected to the same review process.

Satisfied? Label All Pertinent Objects

Only after reviewing all the drawings and assuring that all the drawings are correct and all the drawings necessary are complete should you begin labeling.

There may be questions as to why all drawings should be completed prior to labeling any of the drawings. The answer is really quite simple. Even though the text of the patent disclosure may refer to an illustration by its labeling, the drawings must first be reconciled with the text of the disclosure to assure they agree in description and scope before the drawing is labeled. Only after all have been reviewed should they be picked up again for labeling.

The first step of the labeling process should be to reread the patent disclosure and determine where each drawing should be placed and what labels are required for the drawing. If a feature is being discussed in the text, and a drawing of that feature has been made, then it is essential that the labeling correspond to the text. This cannot be done until the two works are consolidated.

In practice, CAD generated drawings should be printed, and the appropriate labeling penciled in on them. For traditionally drawn illustrations, either a light pencil labeling may be used, or tracing paper may be placed on top of the drawing and the labeling done on the tracing paper. The purpose, at this point, is to identify the labeling and the approximate location for these labels.

Once this has been done, the physical labeling of the drawings should begin. Unlike other stages of the drawing, this should be done in conjunction with any shading required.

Each drawing should proceed from the labeling to the shading before the next drawing is begun. This is simply to assure continuity within the drawings.

Keep labeling to a minimum

One of the USPTO rules discussed in Chapter 2 was that of minimizing the labeling. This must be remembered when the task is actually accomplished. In general, the fewer labels on the drawing the better the drawing will be accepted.

Of course, again per USPTO, there are minimal labeling requirements. The name of the inventor, or the assignee for the patent, should be centered in the top margin of each sheet with the invention name directly below it and also centered. If the application number is known, it should be placed in the upper right corner of this area. These items are required.

In addition, any feature, component, or assembly that is identified in the text of the patent disclosure must be similarly identified on the drawing. This simply means that if we are discussing handle "12" in the text, the handle we are discussing must be labeled with the number "12" on the drawing.

All labeling should read from the bottom of the page

One requirement for labeling is that the labeling read from the bottom of the page. This means that the labeling should be oriented such that when the drawing — not necessarily the sheet — is in proper orientation, the text should read from the bottom.

If the drawing is proportioned such that the main axis is vertical, then the bottom of the physical sheet and the bottom of the drawing coincide and there is no question about the placement and orientation of the text. However, when it is necessary to rotate the drawing in the sight of the sheet, then the text must also be rotated. In such instances the right edge of the page is the bottom of the drawing.

Use text-sized labeling

All labeling should be created in 3.2 mm text with single stroke font. At one time it was common to use more elaborate fonts for labeling of the items, but as the fonts became more and more elaborate, the USPTO requested that a simple, easy-to-use font be used. The height standard was put in place to unify text within a drawing. Looking back on some early patents, through the 1930s, multiple-sized texts were used with little or no discrimination for their use. Often the more important items were labeled with smaller sized text while relatively unimportant items were identified with larger labels. Because there was no apparent reason for these different sizes, the USPTO set one size for all text on a drawing. The one exception to this rule is that the label identifying the drawing may be produced at 5 mm to more readily stand out from the drawing labels.

Other labeling concerns

All drawings should be labeled. Theoretically it is not necessary to label a figure if it is the only figure included in the patent disclosure. However, as cover drawings are now the commonplace occurrence, and it is rare that the cover drawing serve as more than an overall illustration of the device, it is good practice to label all drawings, including the cover drawing.

Because drawings should be labeled consecutively, the cover drawing would be “Figure 1.” This can be represented as “Figure 1,” “Fig. 1” or as a numeric ratio such as “1/7” indicating that this is the first of seven illustrations that are included in the patent disclosure. The option of which style of identification to use is up

to the person submitting the disclosure; however, a simple number, such as “1,” is not an acceptable label under USPTO standards.

The preferred position for the figure identification is at the top of the drawing sight, centered. If this would interfere with the actual drawing, the labeling should be at the upper right of the figure. These are the preferred locations. If the drawing is such that they would interfere with the drawing or they would be confused with other elements, then they may be placed elsewhere. If such alternate placement is required, they should be labeled as “Figure x” or “Fig. x,” which must then be used for the entire submission package.

All features identified should be done so with numerals. These should start with the number “1” and continue until all discussed features and components are labeled. If there are duplicate features, for example left- and right-hand components, they may have a suffix to indicate this. For example, in the sub-assembly shown below, there are two bars that act as stops. They are identical, but in different locations. Rather than each having a unique number, they are identified as “8A” and “8B.”

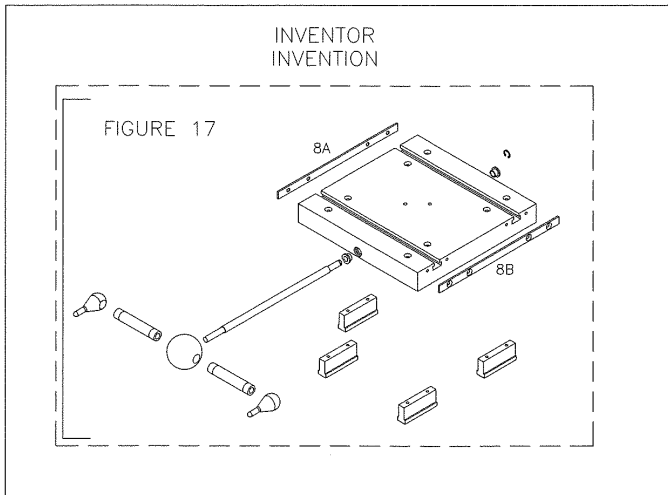


Figure 14-1

A common error in the labeling of such items is including them in either brackets or circles. Although this technique is very common in the manufacturing environment, it is not permitted in patent drawings. Because of this, many upper-end CAD systems that will automatically label and identify components in an assembly put the brackets or circles on a separate layer that may be turned off if so desired.

In general, letters should not be used for defined features or components of the invention. Letter designators are typically used for non-tangible forces and actions. For example, fluid flowing through a pump would be identified with a letter, while numbers would identify the components of that pump.

There is an exception to the rule on letter designations. If the letter is the common designator for a component, or part of that designation, then it should be included in the patent designator. This is most common in electronics where, for example, resistors are listed as “Rx” where the “x” indicates the resistor number. This holds true for most electronic components, as seen in the previous chapter.

Once a reference number has been used for a feature, it may not be used again, except to refer to the same feature in a later part of the disclosure. It is essential that each number used as a reference be used only for a single feature. Using the number “3” for the body of an invention in the early part of the disclosure, then for a connector later in the document, will provide enough ambiguity that the patent most likely will be rejected.

Letters are not the only items to be avoided. One of the most common errors on patent drawings is the inclusion of a scale. Because the USPTO reduces the size of the drawings when they are printed in the final patent, the scale will not be correct. The inclusion of a scale will automatically result in an objection from the USPTO, which will require the drawing to be revised and resubmitted.

Descriptive legends are another area of concern. Although it is often the inventor’s opinion that a drawing needs an explanation, this type of descriptive legend will generally result in an objection by the examiner. The major exceptions to this rule would be in the individual cells of a process flow diagram or a flow chart. Other than in these instances, descriptive labeling should not be used. Remember the first rule of labeling: keep it to a minimum.

In general, proprietary trademarks should not be used. Even if you are comparing to a known and accepted product, the trademark name of the item should not be used. For example, if the discussion is about facial tissue, the common but trademarked name Kleenex® should not be used, but the generic descriptive name

should be used instead. This is true in both the drawings and the general text of the patent disclosure.

Along the same lines, no information covered by a copyright should be included, unless the submitter has ownership, or corporate rights, to that copyright. The inclusion of such information can be considered grounds for rejection of the entire patent, so care should be taken along these lines.

Though there are other rules that pertain to the labeling, they are mainly common sense and involve profanity and adding irrelevant comments.

It is generally preferred to use all upper case lettering. The mixing of upper and lower case can lead to increased difficulty in identifying some items; therefore, it is preferred that only upper case be used.

Leaders should be used only when necessary

Leaders, which are lines connecting features to identifying text, are very common in manufacturing drawings, but should be used only when necessary for patent drawings. It is preferred that the reference number be placed as close to the item that it designates as possible. Only when it is not obvious as to which item a designator applies, should a leader be used.

When used, a leader may either be a straight or curved line. Whichever is used for the first occurrence in the patent disclosure must be used throughout. It is not acceptable to use both curved and straight leaders: only one style may be used and that must be consistent for the entire package.

When leaders are used, care must be taken to assure that they do not cross, or become so close to each other than they could be mistaken for crossing. The distance between two adjacent leaders must be adequate to easily trace each to both the feature they represent and the designator for that feature. Because the drawing will be reduced by the USPTO, if there is any question as to whether they are too close together, they must be considered as being too close together and one of them repositioned.

In an instance when two identical components or features are close together, each must have its own reference number and leader, if required. A single reference number with a leader to each of the instances of the feature is prohibited. Each item must have its own reference designator.

Arrowheads are never shown on patent drawings as a part of a reference leader. Arrowheads are used only to indicate motion, be it the motion of parts of the invention or the motion of mater around the invention.

The exception to this is, once again, in flow charts that are process or computer flow diagrams. In these illustrations the arrowheads are necessary to show the flow of the process, and by that definition, meet the above requirements for using arrowheads.

There are instances when an underlined numeral may be used in place of a leader line. This option may be used when the designator is placed on the physical item. The following figures show some of the “Dos” and “Don’ts” involved with leaders.

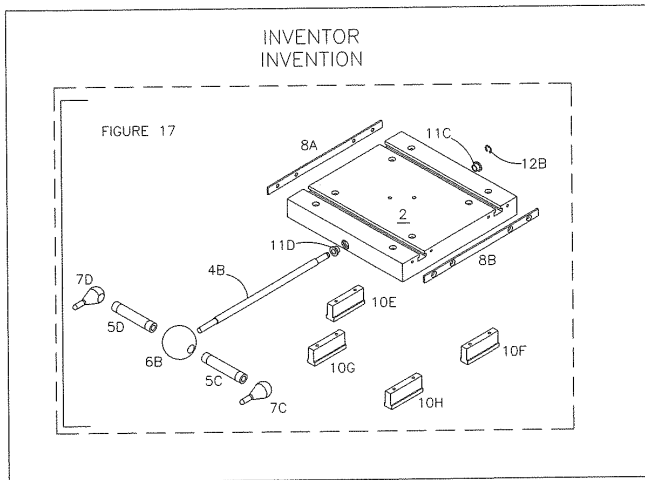


Figure 14-2

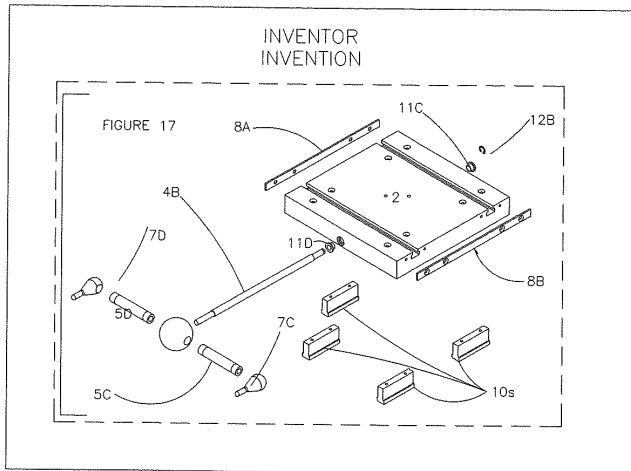


Figure 14-3

In **Figure 14-3** there are multiple labeling errors that must be avoided. The label “4B” has a leader many times the required length. Remember, leaders should be kept as short as possible, while still being recognized as a leader. Label “5C” has a similar error. The label for this component could be placed close to the part and the leader eliminated. “5D” is labeled in a manner where the label lies on top of the part, but not entirely inside the part. The label for the center most component of the handle, “6B,” is missing. With component “7C,” the leader is not necessary and points to the interior of the component, not the edge. The “7D” is unnecessary, misses the component, and has the label misplaced relative to the leader. As with several others, “8A” is unnecessary and the label could be placed near enough to the part. The leader for component “8B” has an arrow. The label for “11C” is too long, while the one for “11D” is too short. Also, “12B” is another example of the leader not touching the part, and being far too long. Finally, part “2” is labeled on the component, which is permissible, but it is not underlined, as required.

Although continuity in labeling is important, it must be combined with continuity in the shading process. Therefore, once a single drawing is labeled, if shading is required for that drawing, it should be shaded before the next drawing is labeled.

Shading

It may seem strange that labeling and shading are grouped together in this review, but they have a major factor in common. When inking, they are responsible for the highest percentage of redrawing. It is very easy to make errors in these two processes, so they should be accomplished as a single task, thus determining whether the drawing will be acceptable from this stage on.

Shading is also similar to labeling; the minimum is enough. This may be a shock to many artists preparing patent drawings, but minimal shading is all that the USPTO needs to see. The majority of the shading done is for artistic purposes and does not add to the clarity of the illustration for the patent process.

Although shading is intended to show a surface texture or contour, it is usually overdone. In most instances a few parallel lines to represent a curved surface are adequate for USPTO purposes. Drawings with shading throughout the entire drawing are often considered ambiguous and dramatic rather than clear and accurate.

When to use shading

Shading should be included only when that shading eliminates possible ambiguity. If the drawing is clear, without shading, it should be submitted without shading. The key to the use of shading is the concept of ambiguity.

For example, a design for a bottle shows both a top and a front view. From these two views it is clear that the bottle is curved. Because there is no ambiguity, shading is not actually required for these drawings, yet, very often shading will be added to the front view to indicate the curved surface. This is not wrong, only unnecessary.

The use of shading is only incorrect when it *adds* ambiguity to the drawing. For example, in the following figure, the surface at the left angles away from the viewer. If the angled surface has shading applied to it, the patent examiner is unsure as to whether this is an angled surface or a curved surface. If it is a curved surface, the shading lines should be closer together as they approach the edge. However, if it is an angled surface it should not be shaded. Now, without looking at other drawings, there is ambiguity. Because it is not the responsibility of the patent examiner to search through the disclosure for a drawing to clarify this drawing, the patent may be rejected.

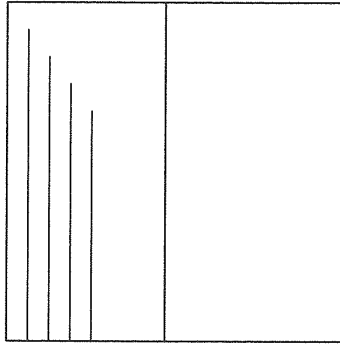


Figure 14-1

Remember, if an examiner rejects the drawing due to ambiguity, the patent is rejected. There is no replacing the drawing for clarification. It must be correct when submitted.

Types of techniques

There are two basic techniques used in the traditional method of drawing: lining and stippling. Both are commonly used, often unnecessarily and interchangeably.

In its true form, lining is a series of parallel, straight lines. These are produced at intervals to imply a change in surface condition. In the bottle example mentioned above, the lines would be widely spaced near the center of the bottle and be shown more closely spaced as they approach the edge.

If looking down on a domed item, short lines would be shown near the center of the item and longer lines towards the edges, but the spacing between them would be uniform.

Typically lining is used to indicate a change in surface conditions, such as a curved surface. At one time, this was the only use of lining that was permitted; though, dependent on the patent examiner it can be accepted for this and other artistic attributes, such as lighting and reflection.

Stippling was initially used to convey the concept of surface texture, but it is now used interchangeably with lining. Stippling is the addition of fine dots to the object to indicate surface texture or change in surface condition. It is used nearly as often as lining to indicate a curved surface.

When used to indicate a curved surface, the stippling would be closer together near the edges of the bottom and the edges of the dome and be reduced to nothing at the center of these objects. A combination of stippling and lining can be used to indicate shading on different materials or a unique pattern or design that is part of the patent application.

Regardless of the type of shading used, it is prohibited to submit any drawing with solid black shading, with the single exception of a bar chart. Because the drawings will be reduced by the USPTO, care must be taken to assure that the stippling and lining will not result in such a condition when reproduced.

Shading aids

If it is necessary to shade a drawing, it is strongly recommended that shading aids be used. Such aids are lined films and stippled films that are available at most graphic arts stores. These may be pressed onto the drawings in the appropriate areas. Although the drawings may not be submitted with such film in place, the later section on inking will discuss why this may be an appropriate means of shading.

Should it be necessary to draw the shading by hand and lining is to be used, the horizontal guide, be it a T-Square or a parallel straight edge or a drafting machine, should be firmly locked in place. If there is no provision for locking this guide, it should be taped to the working surface outside the area of the sheet. This will assure that it does not move during the drawing process. Once this has been accomplished, the lining may be done with any triangle and a sharp, or fine diameter, pencil.

Stippling is done by hand. It is a technique that is not generally intuitive to a person new to the drawing field. If stippling is to be used, a medium width pencil should be used. It is suggested that this technique be first attempted on a copy of the drawing to determine if it is a suitable technique for the user.

Although solid modeling produces a shaded drawing during the modeling process, this type of shading is not accepted by the USPTO. At this point, there is no system that will produce either lining or stippling, so any shading to be added to a CAD drawing must be done by hand.

Drawings that actually require shading should have it applied directly after the labeling for that drawing has been completed. Shading should be accomplished one drawing at a time. The next drawing should then be labeled, and if necessary, shaded.

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The full cost of filing and receiving a patent can be anywhere from \$2,000 to \$10,000 depending on what you need to complete the process. For those who have spent their entire lives developing an idea and a patentable process, it can be incredibly frustrating to know you have to wait just that much longer to pay for the applications, legal forms, and most of all, the patent drawings necessary to move forward. But, if you have the right tools and the right knowledge of everything the government needs from you in a patent drawing, you can bypass much of what has plagued companies and inventors everywhere for decades.

This book has been designed to guide you in the process of developing and producing your own patent drawings in a manner that ensures you can skip over an entire overly expensive step in the process, designing your own drawings and moving that much closer to your patents. You will learn the basics of drawing and using various perspectives to capture real world objects. Learn perspective foreshortening and how to effectively use a pen, ruler, and other drawing instruments. Learn the basics of drawing with a computer and how to use a camera to supplement your drawings. Learn what tools you need for your drawings and how to trace things to speed up the process. Learn how to draw from your imagination and how to draw to scale effectively. You will learn how to use graphical symbols and how to practice enough to get the process correct.



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