Final Diploma

Patent Examination Board

FD2 Drafting of Specifications

Thursday 14 October 2021

10:00 to 14:25 UK British Summer Time (GMT + 1 hour)

Examination time: 4 hours 25 minutes plus 10 minutes upload time

The 4 hours 25 minutes is allocated as follows:

10 minutes – Downloading and printing the question paper;
4 hours – Answering the questions;
15 minutes – Three screen breaks of 5 minutes each.

At 14.25 you MUST immediately stop answering the questions. You then have **10 minutes** in which to upload your Answer document to the PEBX system.

You MUST upload your Answer document to the PEBX system by 14.35. After 14.35 you will not be able to upload it and your examination will be void.

INSTRUCTIONS TO CANDIDATES

1. The whole assessment task is to be attempted.
2. The marks to be awarded are given at the end of the assessment task.
3. The total number of marks available for this paper is 100.
4. You must use the Answer document for your answers.
5. Do not attempt to change the font style, font size, font colour, line spacing or any other preset formatting.
6. Start each part of your answer on a new page. Press the control key and the enter key simultaneously to begin a new page.
7. Do not state your name anywhere in the answers.
8. This question paper consists of **15 sheets**, including this sheet, and comprises:
   Assessment task (1 sheet)
   Client letter (3 sheets)
   Client drawings (5 sheets)
   A spare set of Client drawings for you to annotate and include in your answer if you wish (5 sheets).
9. A spare set of Client drawings is also provided in your Answer document for you to use if you wish.

AT THE END OF THE EXAMINATION

10. Upload your Answer document to the PEBX system. You should upload it as a Word document. PEBX will automatically convert it to PDF.

Assessment Task

Your client sends you the correspondence listed on the Instructions to Candidates sheet regarding a new idea.

Your task is to prepare a complete patent specification that is ready for filing at the UK Intellectual Property Office. The specification should be drafted with a view to obtaining a UK patent.

Note the following:

a) You should assume that the client's description of the prior art in the field is complete.

b) You should not make use of any other prior art or special knowledge that you may have of the subject matter concerned.

c) You should also assume that the client's description of the device and its operation is accurate, i.e. that the device works as described.

Allocation of marks

Introduction and Description: 35 marks
Claims: 60 marks
Abstract: 5 marks
Total: 100 marks

The humble screw has probably been the best-known fastener the world has seen. But it's not perfect, so I've made a better one. There is a lot of information here, so please feel free to cut and paste my text where and when appropriate but removing my chattiness.

Diagrams are attached to explain the various parts of screws and screwdrivers. A screw generally has a threaded shank, which can be tapered, or not, and a head. The shank can have a pointed end or, when flat, is called a machine screw. The head comes in different shapes and sizes and I've focussed on those screws that have a head which protrudes above the surface it is fixed into – my invention won't work with any other type of screw. All screws have something for a screwdriver to engage with which lets you turn the screw – either a single slot for what's called a "flathead" screwdriver, or a cross shape for use with a "crosshead" screwdriver. Screwdrivers of either type have an elongate shaft with a handle at one end for a user to grip and add different forces to, and a blade, the end of which is called a tip, at the other, of the flat or crosshead variety. I've given you Figures 1 and 2 showing screws and screwdrivers, just to be clear.

Generally, screws are easy to use with a screwdriver. However, if something is hard to screw in to, or out of, two problems can arise. No matter how much twisting force you apply (called torsion) to the handle, the tip of any type of screwdriver can easily slide out of the screw head if you don't also apply enough compression – the pressure from pushing a screwdriver towards a screw. It is also important to select the right size of screwdriver for a screw. For a flathead screwdriver, the tip can slip to the side, and even out, of the slot and a crosshead screwdriver has four short surfaces and so can have insufficient contact with the screw slot. Together this can put excessive pressure on the edges of the slot, damaging it and/or the surface below if the tip which is under pressure contacts it. This means you can't easily turn the screw and the quick, uncontrolled movement resulting from slippage can damage the screw head. If there is too much damage, you have to replace the screw you're inserting, as you won't be able to get an effective grip, or the screw becomes really hard to get out. Some people try and achieve more stability by magnetising the tip of an ordinary screwdriver to reduce the likelihood of the screw slipping away from the blade but this, on its own, is not always enough. It is also possible to use screws with two or more protrusions radially outward from the head which can be manually twisted, which may make the screw easier to rotate than using a screwdriver thanks to simple leverage – the torsion is applied from a greater distance than just the screw head. They're not of interest with my invention.

My screw overcomes these problems, and I've worked out a way to stop the screwdriver from sliding up and thus out of the slot or cross.

Per Figure 3, I've cut four notches out of the side of the screw head. Notches seem to be the best way forward as it means I can start with a standard screw with a head that protrudes above a surface. Those screws that have protrusions for manual twisting take up too much room and are difficult to store as the protrusions can get caught on things. The notches should ideally have parallel sides so anything inserted into them has the best chance of gripping due to a matching shape. These notches are easily drilled or machined, or screws can be stamped or moulded like this; it's not important.

Per Figures 4 and 5, I need a device to engage with these notches which can grip the screw and hold the screwdriver tip against the screw. I tried a single recess running almost all the way around a screw head, but it was hard to grip and weakened the screw. So, my device has an elongate collar around the screwdriver shaft and four moveable engagement arms each connected to the collar via a pivot (not shown) and extending away from the collar towards the screwdriver tip. Each of the four arms is divided into a first and second part, with the first, upper part being attached to the collar. As you'll see, the arms need to be in two parts – I've only shown you one arm in Figure 4 for clarity. Looking at Figure 4 specifically, at the end of each of the first parts is another pivot and a second, lower part connected to the first, the second part being long enough to extend beyond the screwdriver tip. I welded a small loop on the inside of each arm part facing the shaft, and another loop on the collar. The loop acts as a fixing and guide for a wire (see later) and could, of course, be something else, such as a hole in the arm or a hook; it doesn't really matter.

Where I could have just bent the far (distal) end of the second arm part, I welded some "pins", created by cutting the heads off some nails, which I pointed inwards towards the screwdriver shaft. With the pivots, the distal ends of the second arm parts are movable towards and away from the shaft, i.e. radially. Because of this movement, the ends of these pins can be inserted into and out of the notches in the side of the screw head: I machined the sides of my pins to give two parallel sides to best fit the parallel sides of the notch.

To make sure the collar stays in place, I drilled a threaded hole in it. I can then put an ordinary screw with a wide head in that hole which I just hand tighten against the shaft. A machine screw is ideal for this. I suppose a few screws would help ensure the collar can be centred around different sized shafts.

I then secured a wire to the loop on the second arm part, ran it through the loop on the first, towards the collar. The wire then enters a ratchet secured to the collar. I added a small handle to each first arm part which a user can grip to move the arms, rather than fiddling directly with the wires or using the middle pivots.

To tighten a screw, you locate it in the hole or on the surface you intend to screw into and ensure there is no tension on the wire, so the arms go "limp". You put the tip of the screwdriver in the screw head lightly to locate it and then, using the handle, move each pin into a notch. Then you tighten the ratchet, which applies tension to the wires, pulling the arms upwards and forcing the screwdriver tip into the notch or cross in the head, the wires providing a tension mechanism and reducing the chance of slippage between the screw and screwdriver. Do this for each of the four arms, urging the screw head towards the tip, there's less chance the arms will separate from the screw, and the user doesn't need to use as much compression on the screwdriver as it is urged toward the screw.

Because there are notches in the screw head, you can screw the screw into whatever you're fixing it to, and then move the pins out when the screw is tight enough – they just slide out of the notch when tension on the arms is released, give or take a small tug if they're magnetised. Likewise, when removing a screw, because this only works with screws with an exposed head, the notches in the head will always be exposed so you can reverse the process and, on your first turn of the screwdriver, you've been able to grip the screw head to urge the tip into it so there's much less risk of it slipping sideways or up.

As an alternative to the wire, I tried a tension spring connected to the loop on the second arm, running through the loop on the first arm, and connected to the collar. When not applying any external forces, these springs pull the arms up away from the tip. The handle helps pull the mechanism down, to help engage the notch. On releasing the handle, the springs apply tension to the arms, pulling them up, holding the engagement protrusions in the notch, and thus the screwdriver to the screw head. Removal of the protrusions is easily achieved by pushing the handle downwards to release the tension on the springs and let the pins out.

It would be useful to connect the arms to each other so that if one is pulled up or down, the rest move together. It would save the complexity of trying to deal with each arm individually.

I want to sell whole screwdrivers, and an add-on device to retrofit existing screwdrivers.

I don’t think you need the two-part arms to be pivoted and I’ve given you an alternative in Figure 5. There are still two parts, but the first arm part is secured to the collar, and the second arm part is slidable relative to the first, which still has a tension mechanism like those for the pivoting arms. Having a pivoted part is useful for getting the pins in and out as it gives you more freedom to move them around. Getting the pins in and out would be slightly harder with slidable arms, so it would be useful for there to be some ability to move the slidable arm radially at the end of the arm part closest to the screw to assist with engaging with a notch. I tried the device with two arms, but it wasn’t really stable. Four is naturally good for aesthetics and balance, three makes the device look attractive and is effective if they’re spaced roughly equally apart from each other. By the way, a ratchet is a very well-known device which allows you to pull a wire or similar through in short stages in one direction and temporarily secure it in place to apply tension. A simple button releases tension from the wire.

Screws and screw types

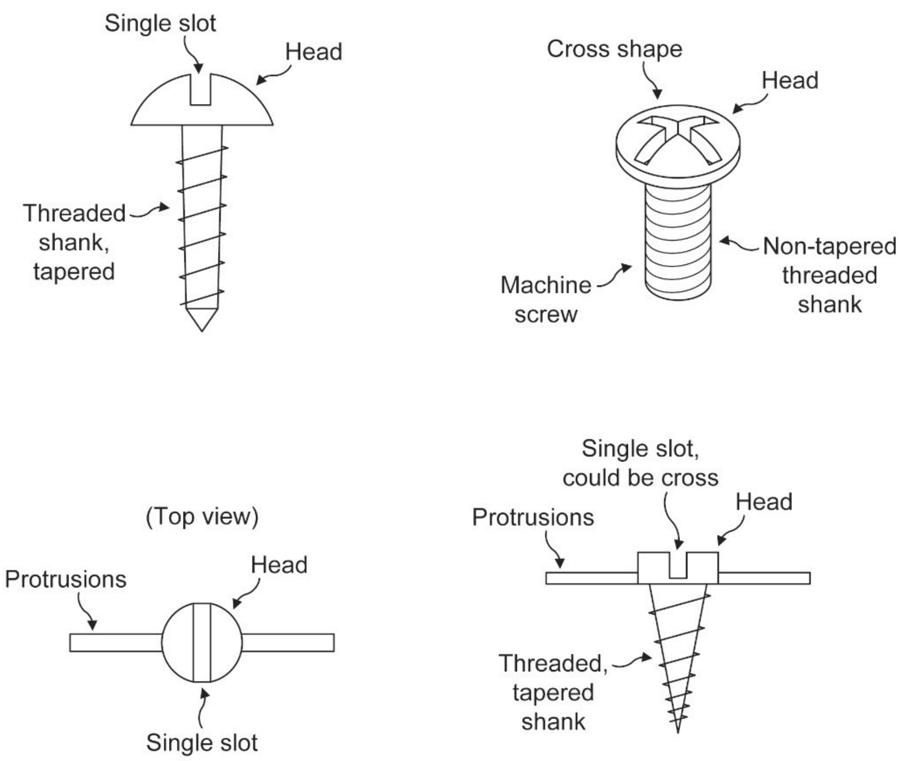

FIG. 1

Screwdriver types

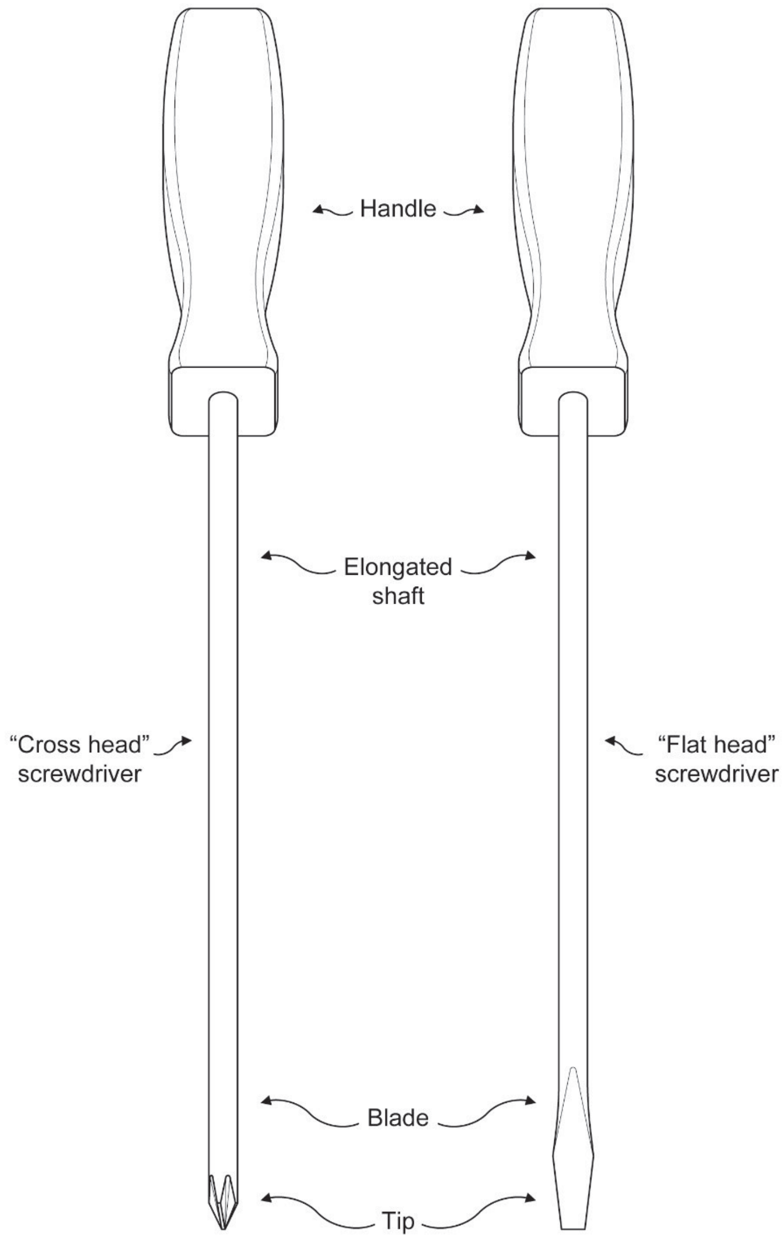

FIG. 2

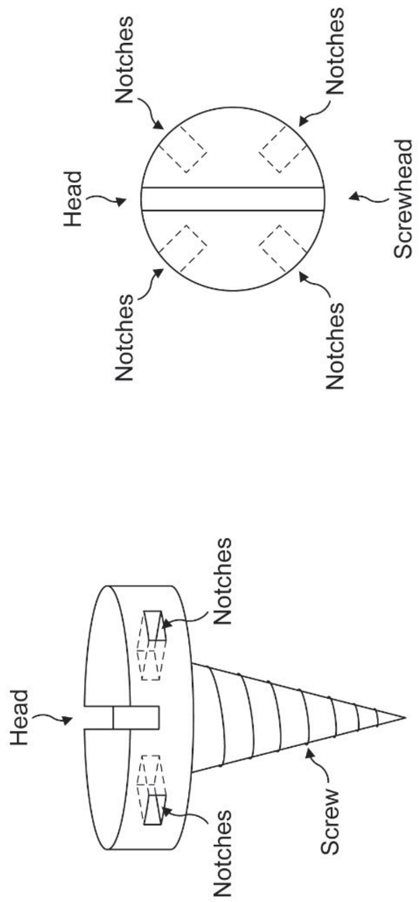
Notches
Notches
Head
Screwhead
Notches
Notches
Head
Notches
Notches
Screw

FIG. 3

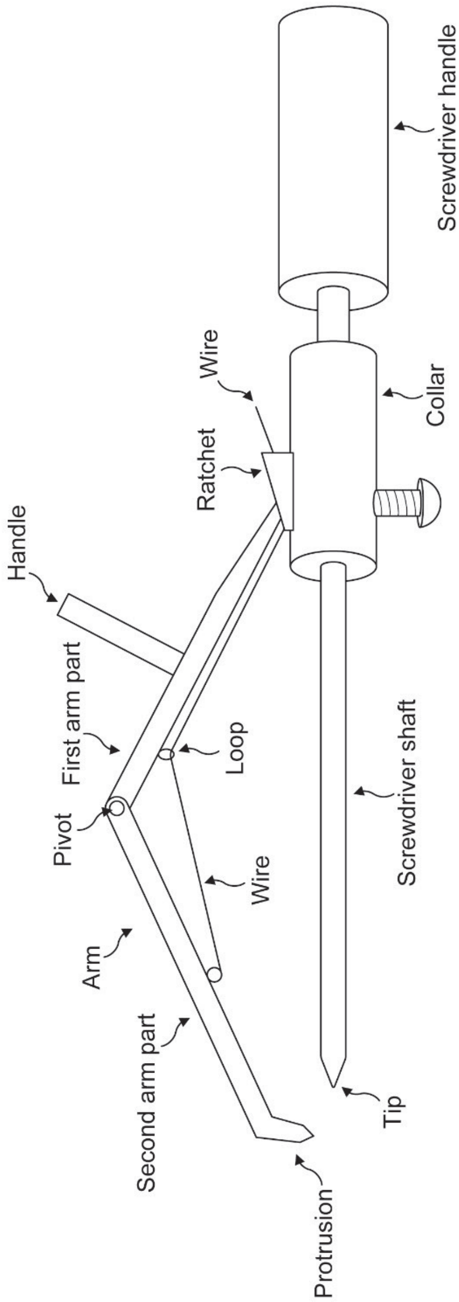
Screwdriver handle
Wire
Collar
Ratchet
Handle
First arm part
Loop
Pivot
Wire
Screwdriver shaft
Arm
Second arm part
Tip
Protrusion

FIG. 4

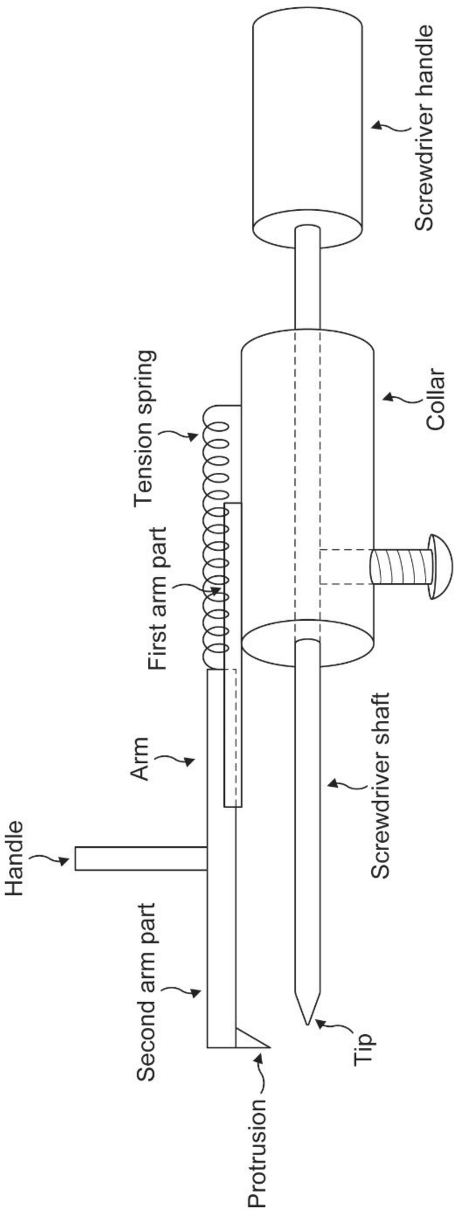
Screwdriver handle
Collar
Tension spring
First arm part
Arm
Handle
Second arm part
Protrusion
Tip
Screwdriver shaft

FIG. 5