<u>PATENTS EXAMINATION BOARD</u>

Subject: The Drafting of Patent Specifications - Paper 2

Date: June 2021

Time: 09h00 -13h00 (although candidates requiring extra time are entitled to an additional two hours)

Examiners: L Cilliers
V Williams

Moderator: J D Whittaker

Attached is an instruction from your client detailing an invention. You are required to draft a full patent specification for your client's invention. The full patent specification must include: (1) a background to the invention, (2) a brief description of the drawings, (3) a detailed description of the invention, (4) a set of patent claims, and (5) an abstract. **No summary of the invention (consistories) is required.**

Marks will be allocated as follows:

- 60% of the marks will be allocated to the claims.
- 40% of the marks will be allocated to the rest of the specification.

In order to obtain a pass for this paper, candidates must obtain not less than 40% for each of these two sections.

The paper includes a set of drawings with no numbering. Please hand in a numbered set of drawings.

Your client writes:

I have been working in the mining industry as a rock engineer for many years. The humble mine prop remains, to this day, one of the most important roof support devices in our business. In case you don't know, a mine prop is a support post that is used as a roof support in the mining environment. In particular, it is often used to support a hanging (or upper) wall of a stope relative to a foot wall (or floor) of a stope. A stope is really just an excavated tunnel in a mine, which then requires support once excavated to prevent it from collapsing.

If you look at this photo, you will get the idea:

Props are traditionally made from timber, but some steel props are apparently also available in the marketplace.

In many applications mine props are designed to yield (just another way of saying to give way by breaking or buckling when the load becomes to high), but the design of these props should obviously still be such that they don't fail unpredictably below the design loads. These props should remain rigid up to a certain load, but when the load of the hanging wall or roof exerted on the prop exceeds the design value, the yielding prop must collapse. Let's not worry too much about the reason for this – it is enough to know that the prop is actually designed to 'fail' at a certain load.

In present applications where a yielding wooden prop is required, the wooden props are formed by modifying the structure of the prop. This can, as for example seen in the figure below, be done by making wedge cuts in the bottom end of the prop so that the prop has a weakened zone where it will fail if the load exceeds a certain limit.

Unfortunately, it is difficult to arrive at accurate designs when working with wood, because the strength of wood is somewhat unpredictable due to various reasons including the quality of the wood, the presence of knots, and the grain structure of the particular piece of timber used. The lack of certainty regarding the yield strength of a particular piece of timber is an intrinsic design shortcoming when designing wooden props, and is even more problematic when designing a yielding prop. This is one of the reasons why it has been suggested for steel props to be used when there is a need for yielding props, but steel props are expensive to manufacture, and impractical to haul around in mines. Even when steel props are used, it remains important to be able to design these props to yield at the correct levels with accuracy and predictability.

I have come up with a new idea, and that is to use a new kind of prop configuration that will make it easier to design yieldable props, irrespective of the material from which the prop is made. I think the design will be particularly useful when manufacturing props from engineering plastics, but I suppose it can also be used for steel props.

My idea (shown in the figures 1 to 5 below) takes the form of a prop that includes an inner and an outer tube, wherein the tubes are telescopically displaceable relative to one another. I suppose the inner tube can be the lower tube or the upper tube. In my preferred design the inner tube is structurally reinforced (as seen in Figures 2 and 3), which allows the use of a thinner walled tube, and hence results in a cost and weight saving. It will also be possible to reinforce at least part of the outer tube as well, in particular if the prop is only designed to collapse to a limited degree. The reinforcement can take the form of a cross-shaped gusset extending inside the tube. I can imagine the reinforcement structure being of various shapes and configurations though. For the sake of clarity, I am not showing the reinforcement in the cross-sectional views shown in Figures 4 and 5.

In Figure 3, the inner tube is shown on its own, and apertures for receiving shearing pins (more on that below) are also shown.

A shearing pin (best seen in figures 1, 4 and 5) extends through both the inner tube and the outer tube. There may only be a single shearing pin, or there may be more than two shearing pins – but I have opted for two ninety degree offset shearing pins in what I believe is the optimal design. My chosen configuration can be best seen in the cross-sectional end view of Figure 5. The shearing pins are typically made from a suitable metal.

The benefit of this configuration is that I can make the tubes quite strong, and that I then only need to worry about the shearing strength of the shearing pin to ensure that the prop yields at the correct load. When the shearing pin fails, the prop will simply collapse telescopically. I think this design will really work well, and will improve the performance of the yielding prop, whilst also reducing the cost of the prop compared to metal variants. I should, however, point out that the shearing pin is not the only design that could work, and that other mechanisms could also be utilized. One could, for example, also have a configuration where the operatively upper tube includes a rib or shoulder formation that rests on the end section of the operatively lower tube when the prop is in an extended configuration, and which deforms and/or breaks when the load on the prop is exceeded, thus allowing the prop to collapse telescopically. The design may be a little more difficult, but I believe it is perfectly workable. One way in which this may work is shown in figure 6.

Another benefit of the new invention is that the prop can be transported in a disassembled condition, and the two parts can be connected to one another (using the shearing pins) when the prop is installed. This makes for much easier transportation, in particular down in a mine.

Please help me to obtain protection for my new idea?

END

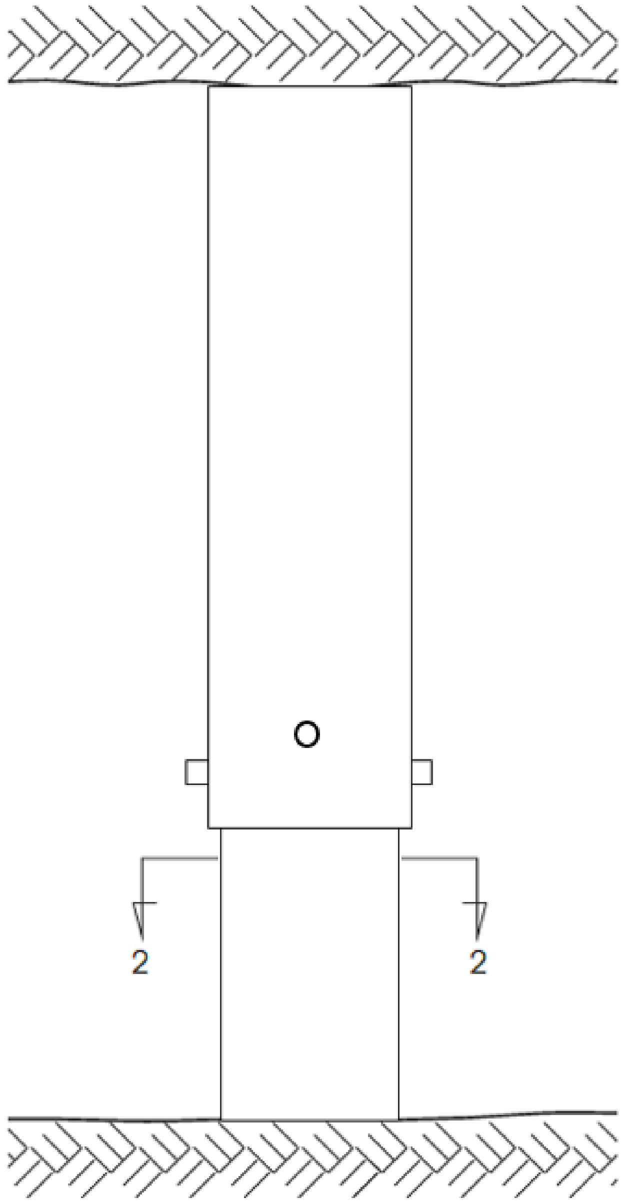

Fig .1

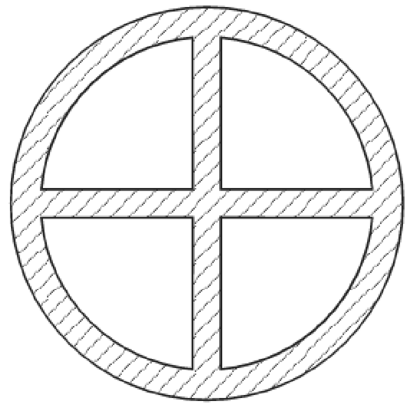

Fig .2

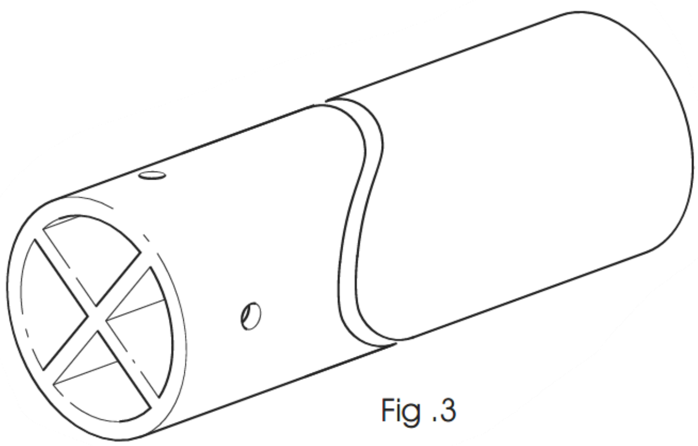

Fig .3

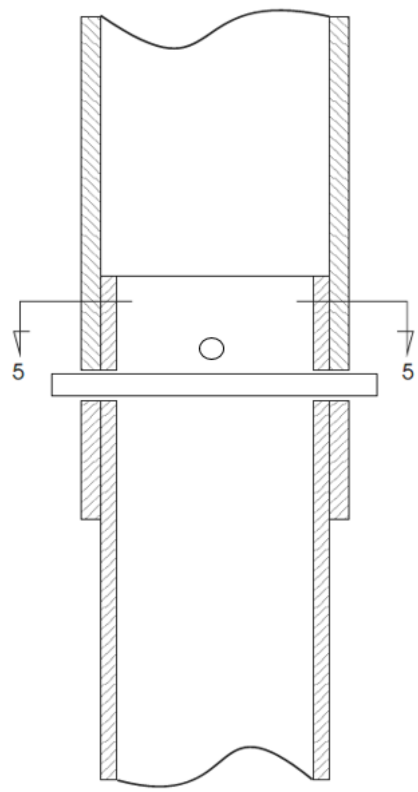

Fig .4

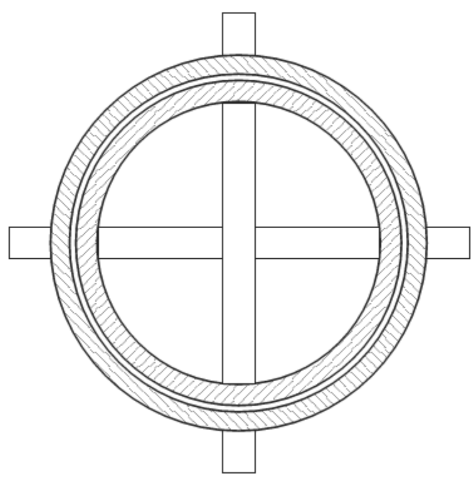

Fig .5

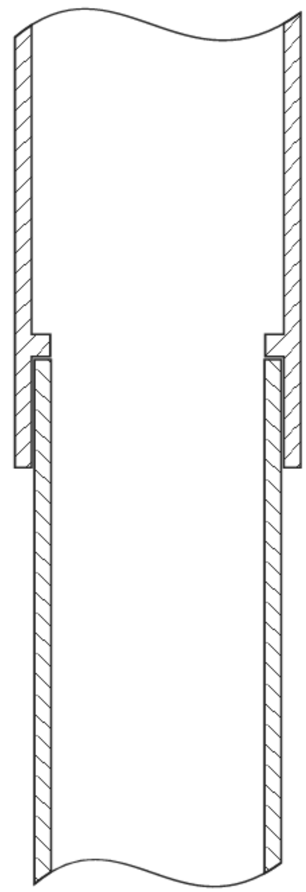

Fig .6