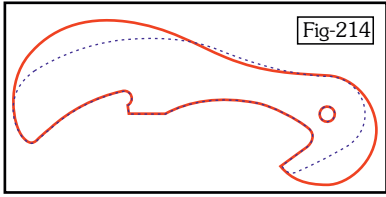


Making small adjustments to existing drawings within CorelDRAW! is very easy but still seems to take forever. Adding the bulge indicated by the dotted red line in Fig-212 appeared to be the best option - whatever the material I choose - and by adding that it would also be necessary to increase the bulge at the top so that the weight is sensibly distributed because the Pawls are only kept in contact with the Ratchet due to gravity. In Fig-214 you can



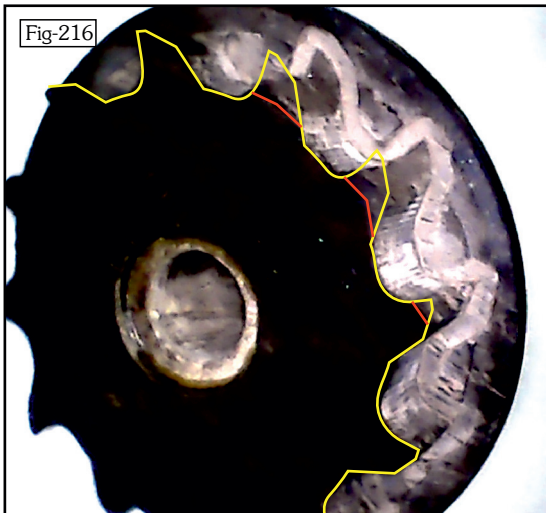
see the outline of the new Pawl in red compared to the old Pawl (dotted blue). The geometry of the main part is naturally not changed.

Considering the options open to me as far as the material with which to make the new Pawls, I was concerned that - now I know the Drive Weight is likely to be in excess of 3kg, (I had originally anticipated about 2kg or less) - Maple, Beech, Ash, Oak, Elm etc. are unlikely to be strong enough to withstand the forces involved for very long. Other options are, Tufnol, (a Phenolic Resin Laminated material which essentially has no 'grain'), Brass or Aluminium.

The later two probably could be cut on the Denford but I've not yet dipped my toe in that water so I settled for Tufnol and the result can be seen in Fig-215 where the Pawls are mounted on the Main Drive Gear.



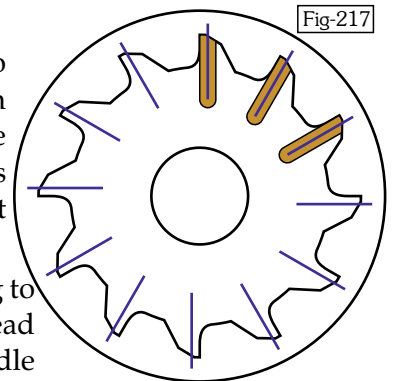
As there had been damage to the Pawls I was not at all surprised to find that when I dismantled the Winding Drum from the Main Drive Gear, there was also damage to the Ratchet. That is quite difficult to photograph so I've done some enhancements to Fig-216 where the Yellow line shows where the Ratchet teeth should be (were!) and the red lines indicate the damage which amounts to three of the teeth.



The Ratchet is already glued to the Winding Drum so affecting a repair to this is going to be fraught with issues.

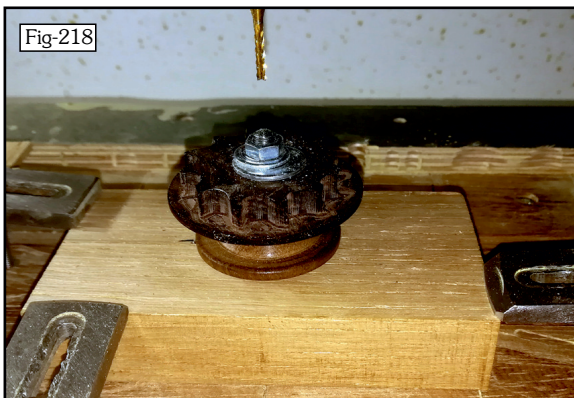
I could make a new Ratchet and destroy the existing one by holding the Winding Drum in the lathe and machining it away but I think that inserting Brass 'Teeth' would be preferable. These might be glued into radial slots which could be cut using an engraving MOP using the blue lines in Fig-217.

One problem with this is that I need to find a way to hold the assembly which is the Ratchet & Winding Drum on the Denford Table so that the Ratchet is uppermost but the bottom of that assembly is only 12mm Ø.



The centre of the Denford Table has an M6 threaded insert so I made a locating peg to fit the centre of the Winding Drum with an M6 thread on the bottom and an M5 thread at the top. This would 'locate' the Ratchet but wouldn't hold it well enough to handle cutting the slots for the Brass teeth so the possibility for it to move would be high.

Next I bored a close-fitting hole in a block of Oak which can be clamped to the table and milled a slot into which the M3 Grub Screw which clamps the Winding Drum to the Drive Spindle can fit thus arresting any potential movement.



The Ratchet is now positioned on the Denford Table and Fig-218 shows it with a 2mm Ø burr at X0-Y0 but I've just realized that I haven't taken account of the precise orientation of the Ratchet Teeth . . . . . This is going to be important because initially I'm thinking of just inserting Brass teeth at the position of the three broken ones might do the job.

. . . . . Now I have correctly aligned the block, I've noticed that a fourth tooth has some damage so that will also be replaced.

One of the issues I've become acutely aware of, as far as CNC Machining is concerned, is having the work-piece held firmly. Any possibility that it could move during a cut is pretty much certain that it will move and cause damage to either the work or the cutter - or even both! So, I was well pleased to find that this set-up worked very well. In Fig-218 the clamps are gripping the Oak block by about 2mm - they were firm enough but when I re-aligned it to correctly orient the Ratchet Teeth I increased this to nearer 6mm and it was solid as a rock.

Using a DOC = 0.5mm limited the stresses and the four slots were perfectly positioned. Making the Brass teeth was just a 'fiddle' at 5mm x 9mm x 2mm and one end rounded over but they were easily glued into the slots with CA,

Fig-219



left for 10 minutes before mounting the Drum in the lathe and taking cuts of about 0.2mm soon got all the Brass Teeth at the same height as the wooden ones.

This of course left them 2mm wide with no relief and filing the back away when the length of 'stroke' for the file was only 7mm was interesting.

Doing 'repair' work might be interesting in-as-much-as it is always a one-off job and often needs ingenuity, but it does take an inordinately long time! It may well be that I could have re-made the complete Ratchet in less time but the chance of similar damage would still be present.