

7.0 Figures

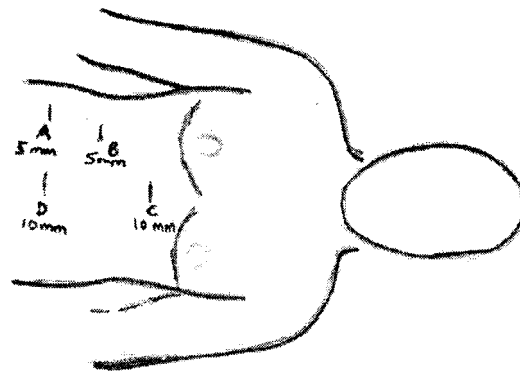


Figure 1. Incisions during Laparoscopic Cholecystectomy

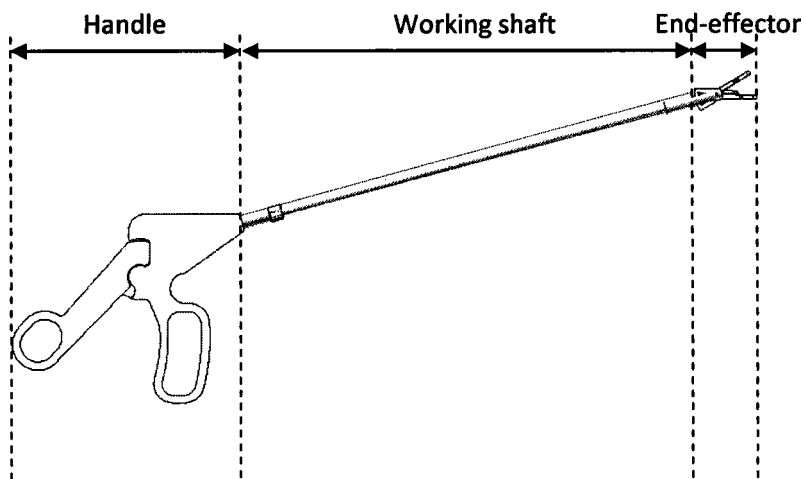


Figure 2. A typical instrument used in LC procedures

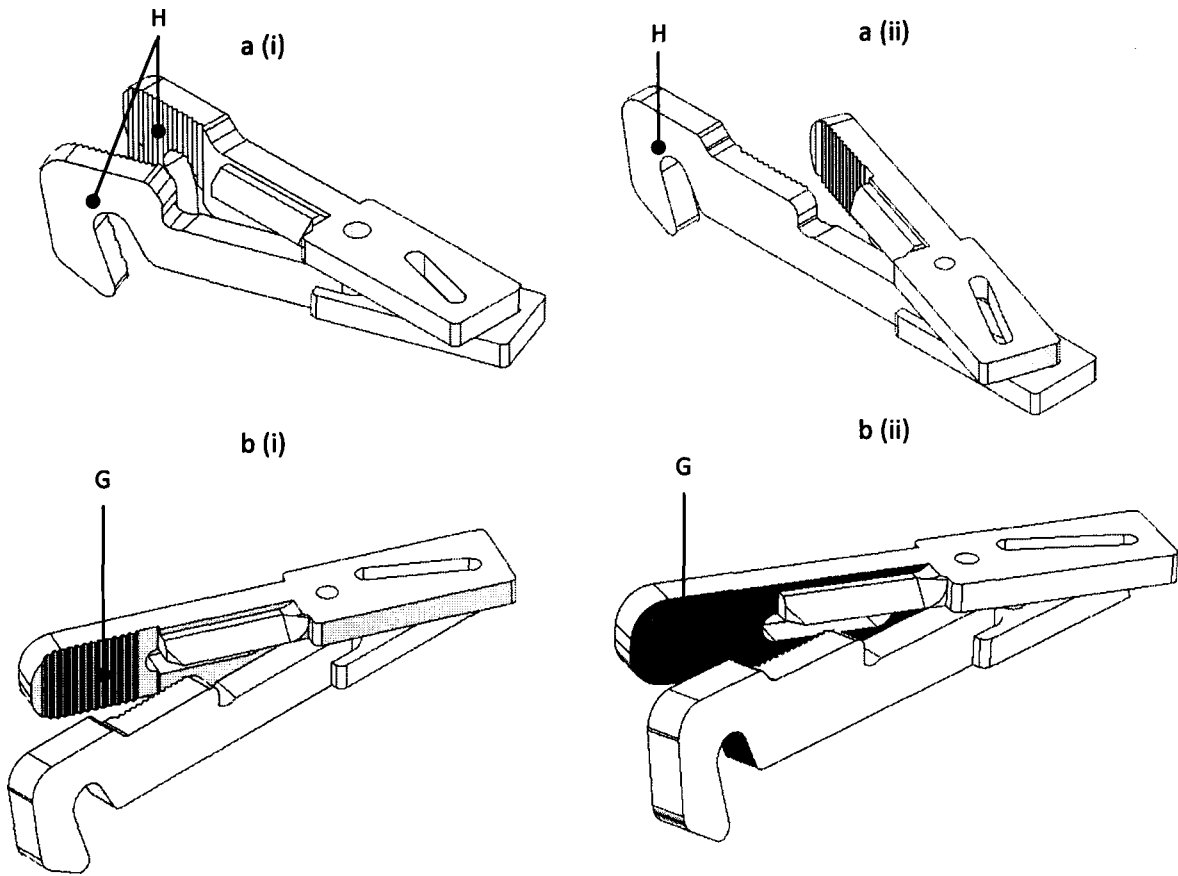


Figure 3. Different Embodiments of H (Figure a (i) and a (ii)) and G (Figure b(i) and b (ii))

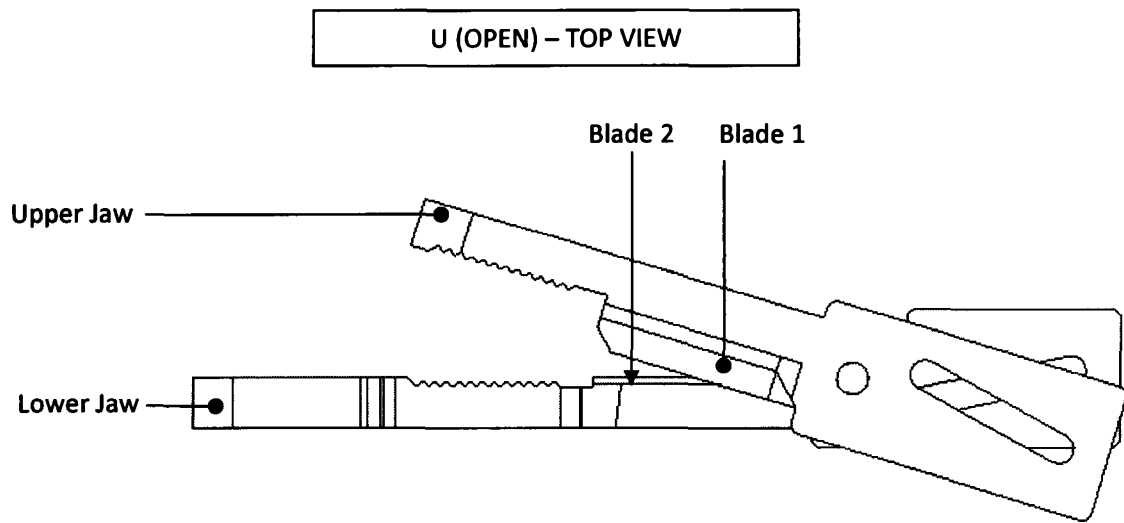


Figure 4. S_U with the blades open (top view)

U (CLOSED) – NE ISOMETRIC VIEW

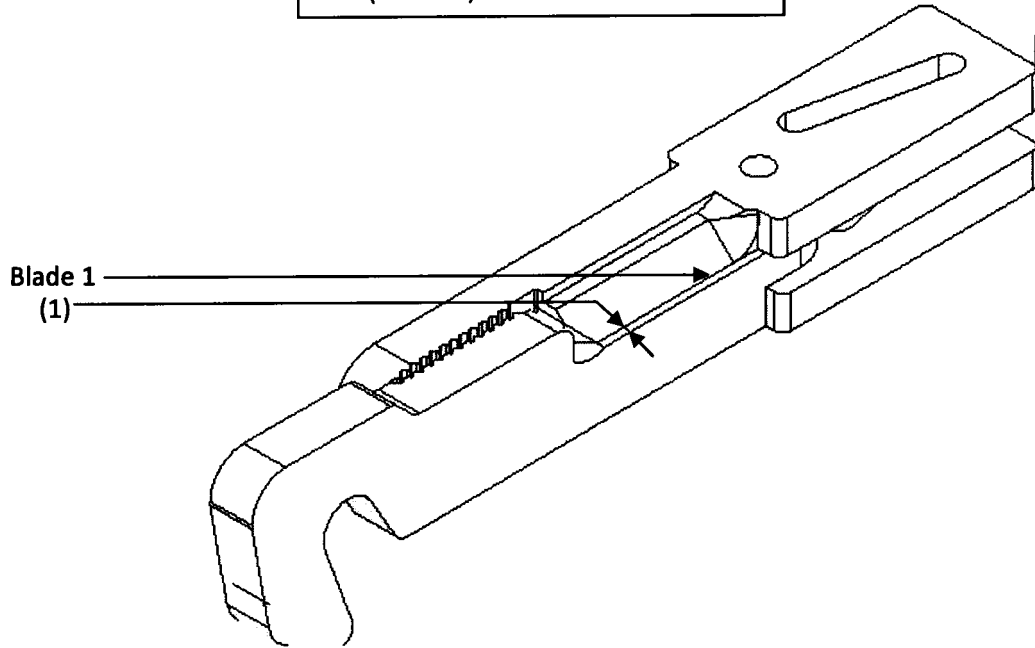


Figure 5. S_U with the blades closed and showing detail (1)

U (OPEN) – NE ISOMETRIC VIEW

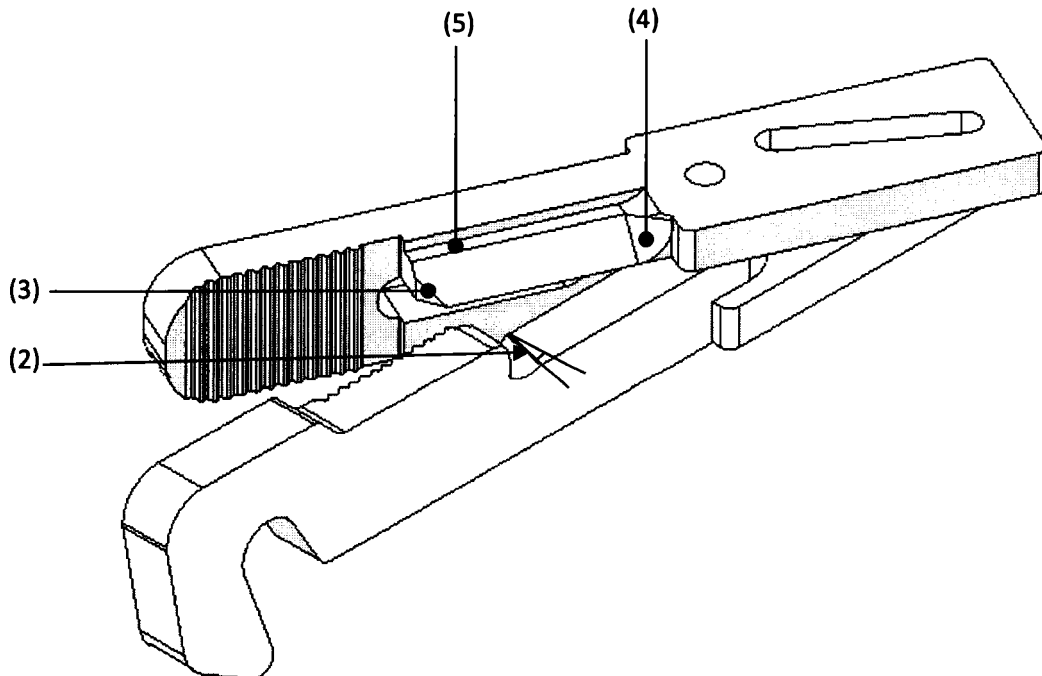


Figure 6. S_U with open blades showing details (2), (3), (4) and (5)

U (CLOSED) – FRONT VIEW

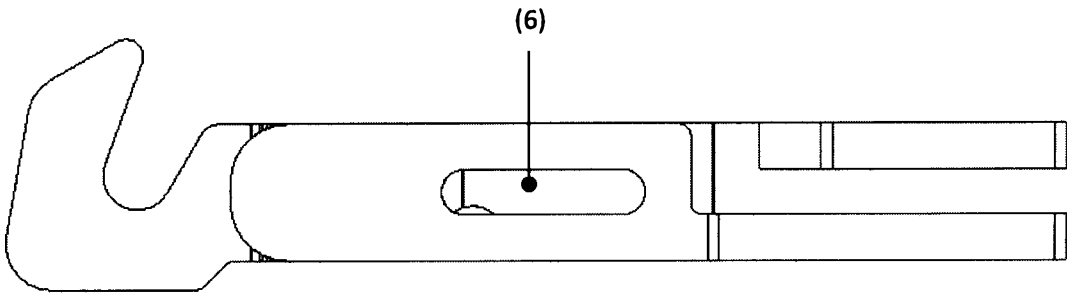


Figure 7. U showing detail (6)

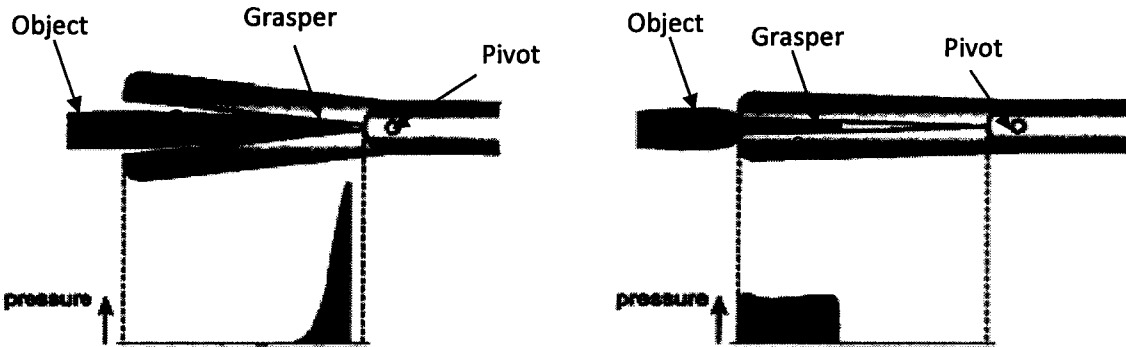


Figure 8. Pressure on Object when (a) Grasper is placed close to pivot (b) Grasper is placed away from the pivot (adopted from De Visser 2003)

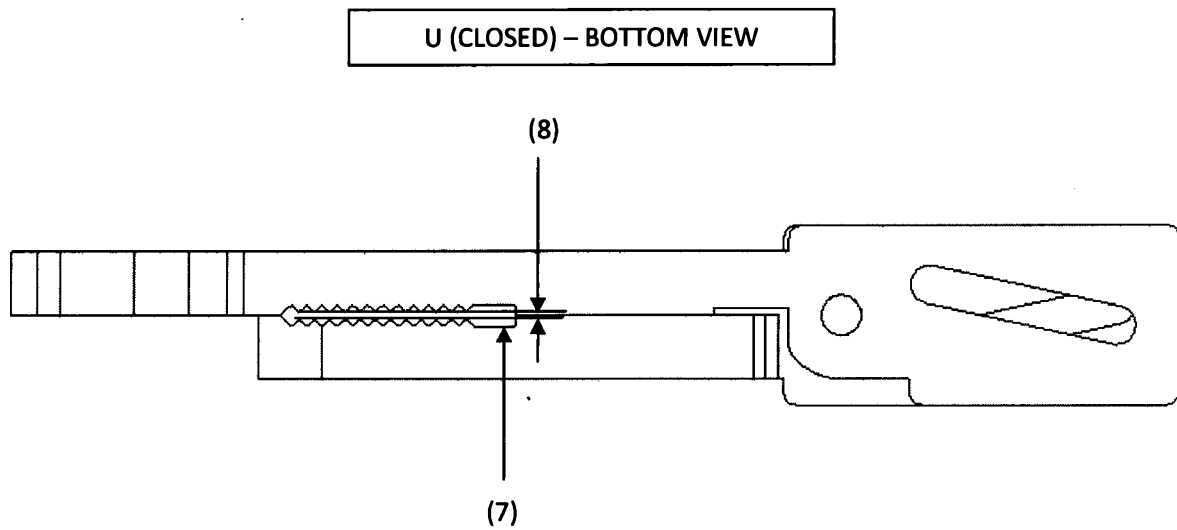


Figure 9. G_U with details (7) and (8)

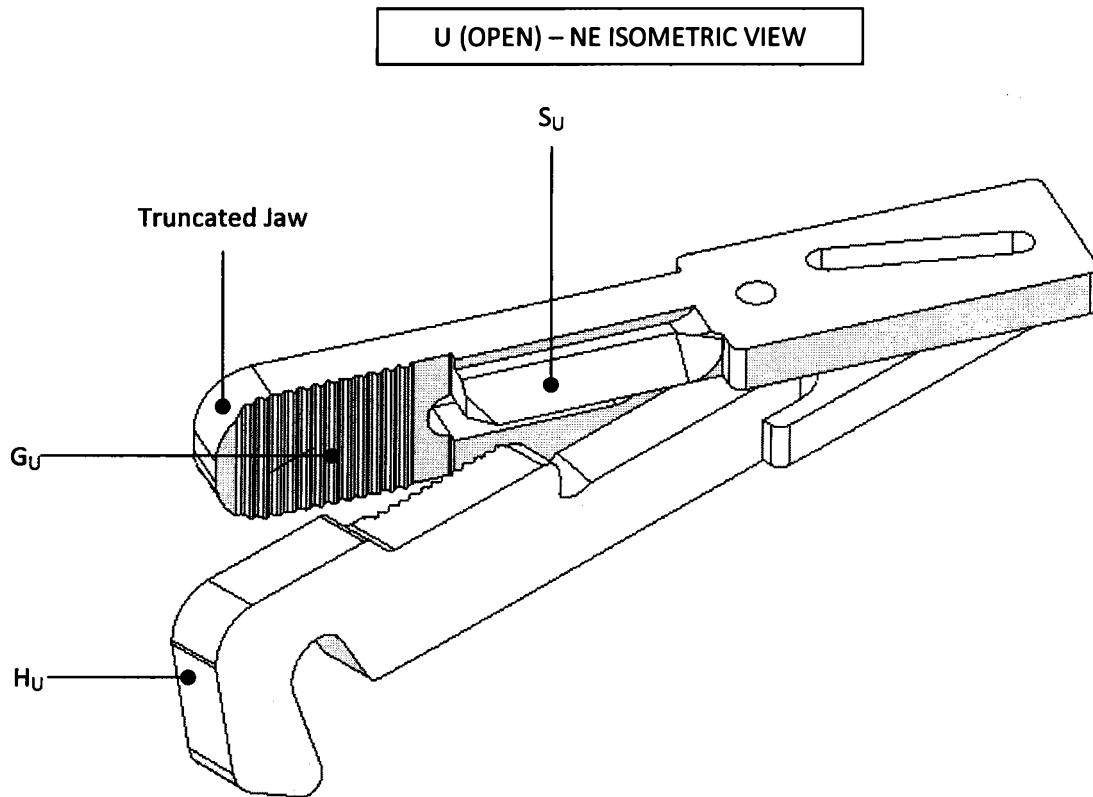


Figure 10. Placement of H_U and truncated jaw

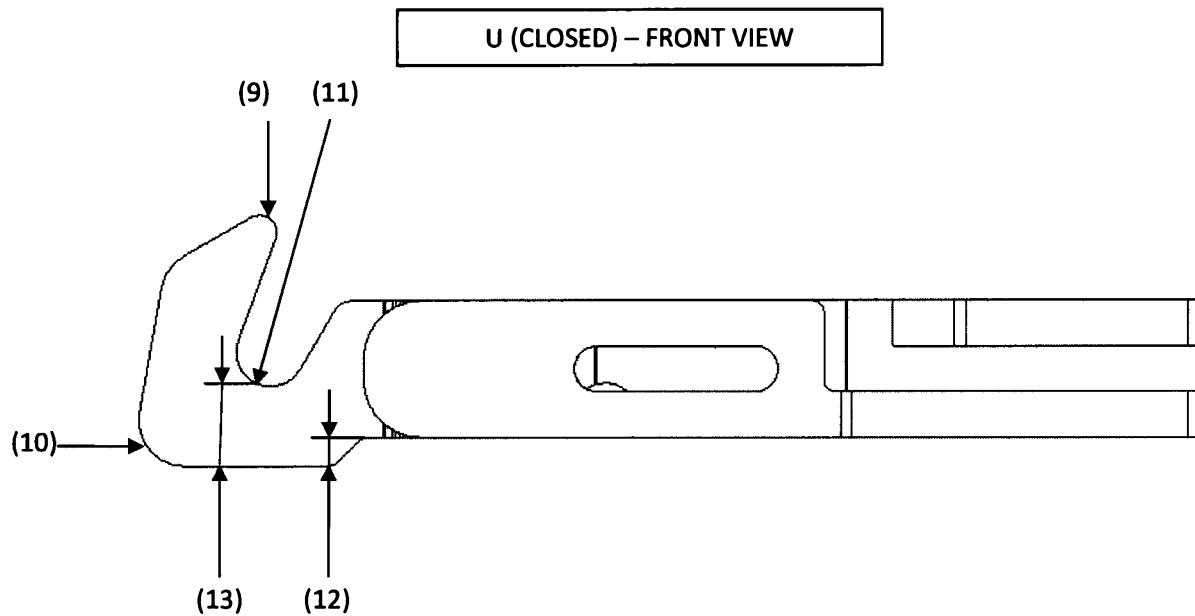


Figure 11. H_U with details (9), (10), (11), (12) and (13)

7.0 Tables

Table 1. Instruments passed through the different incisions during a typical Laparoscopic Cholecystectomy MIS operation

| Incision A | Incision B | Incision C | Incision D |
|------------|------------|------------|------------|
| G | G | G | L |
| | | H | |
| | | CA | |
| | | S | |
| | | H | |
| | | CA | |
| | | S | |
| | | H | |
| | | CA | |
| | | H | |
| | | G | |

Table 2. Comparison between existing single functional instruments and the Invention

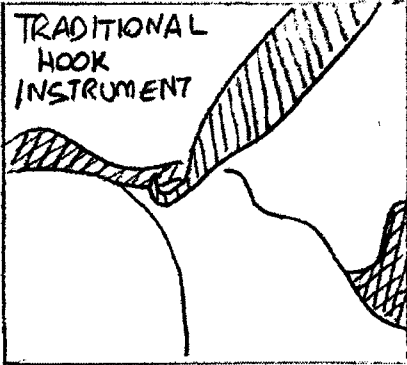
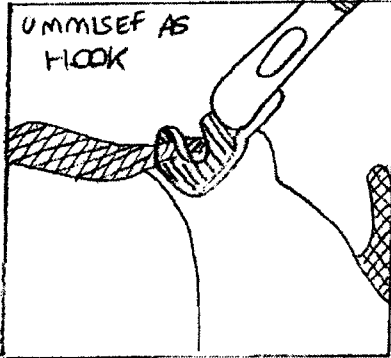
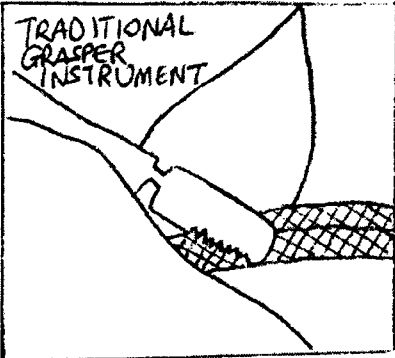
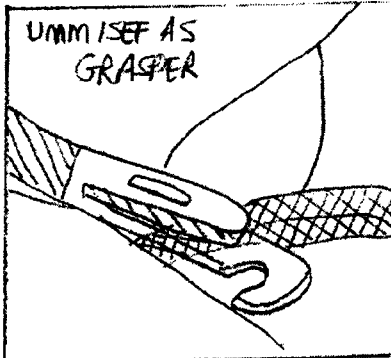
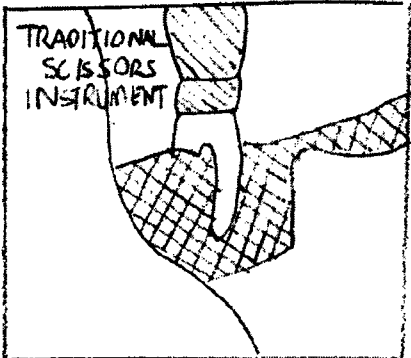
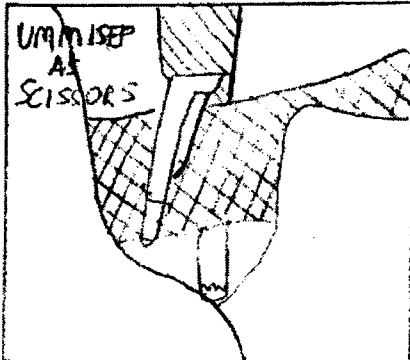
| Existing Single Functional Instruments | The Invention |
|--|--|
| <p>TRADITIONAL HOOK INSTRUMENT</p>  <p>A hand-drawn diagram showing a traditional hook instrument. The instrument has a long, thin handle and a curved, hook-like tip. It is shown grasping a piece of fabric with a cross-hatched texture.</p> | <p>UNIMISEP AS HOOK</p>  <p>A hand-drawn diagram showing the invention used as a hook. The invention has a handle with a ring at the end and a curved tip. It is shown grasping a piece of fabric with a cross-hatched texture.</p> |
| <p>TRADITIONAL GRASPER INSTRUMENT</p>  <p>A hand-drawn diagram showing a traditional grasper instrument. The instrument has a long handle and a curved, hook-like tip. It is shown grasping a piece of fabric with a cross-hatched texture.</p> | <p>UNIMISEP AS GRASPER</p>  <p>A hand-drawn diagram showing the invention used as a grasper. The invention has a handle with a ring at the end and a curved tip. It is shown grasping a piece of fabric with a cross-hatched texture.</p> |
| <p>TRADITIONAL SCISSORS INSTRUMENT</p>  <p>A hand-drawn diagram showing a traditional scissors instrument. The instrument has two handles and two blades. It is shown cutting a piece of fabric with a cross-hatched texture.</p> | <p>UNIMISEP AS SCISSORS</p>  <p>A hand-drawn diagram showing the invention used as scissors. The invention has two handles and two blades. It is shown cutting a piece of fabric with a cross-hatched texture.</p> |

Table 3. Comparison between the numbers of swaps carried out using single-functional instruments vs. the claimed combination

| | Incision C (using single-functional instruments) | Incision C (using claimed multifunctional instrument) |
|------------------------|---|--|
| | G | U |
| | H | |
| | CA | CA |
| | S | U |
| | H | |
| | CA | CA |
| | S | U |
| | H | |
| | CA | CA |
| | H | U |
| | G | |
| Number of swaps | 10 | 6 |

8.0 References

De Visser, H., 2003. *Grasping Safely: Instrument for Bowel Manipulation Investigated*, Ph.D., Delft University of Technology.

Frecker, M., Haluck, R., Dziedzic, R. and Schadler, J., 2007. *Multifunctional Tool and Method for Minimally Invasive Surgery*. United States Patent, Patent No. 2007179525.

Frecker, M., Schadler, J., Haluck, R.S., Culkar, K. and Dziedzic, R. Laparoscopic Multifunctional Instruments: Design and Testing of Initial Prototypes, *Journal of the Society of Laparoendoscopic Surgeons*, no.9, 2005, pp. 105-112.

Janulova, 2005. *Surgical Operations Annual Report 2004*, Malta: Data Management Unit, St Luke's Hospital.

Janulova, 2006. *Registered Surgical Operations Annual Report 2005*, Malta: Data Management Unit, St Luke's Hospital.

Janulova, 2007. *Registered Surgical Operations Annual Report 2006*, Malta: Data Management Unit, St Luke's Hospital.

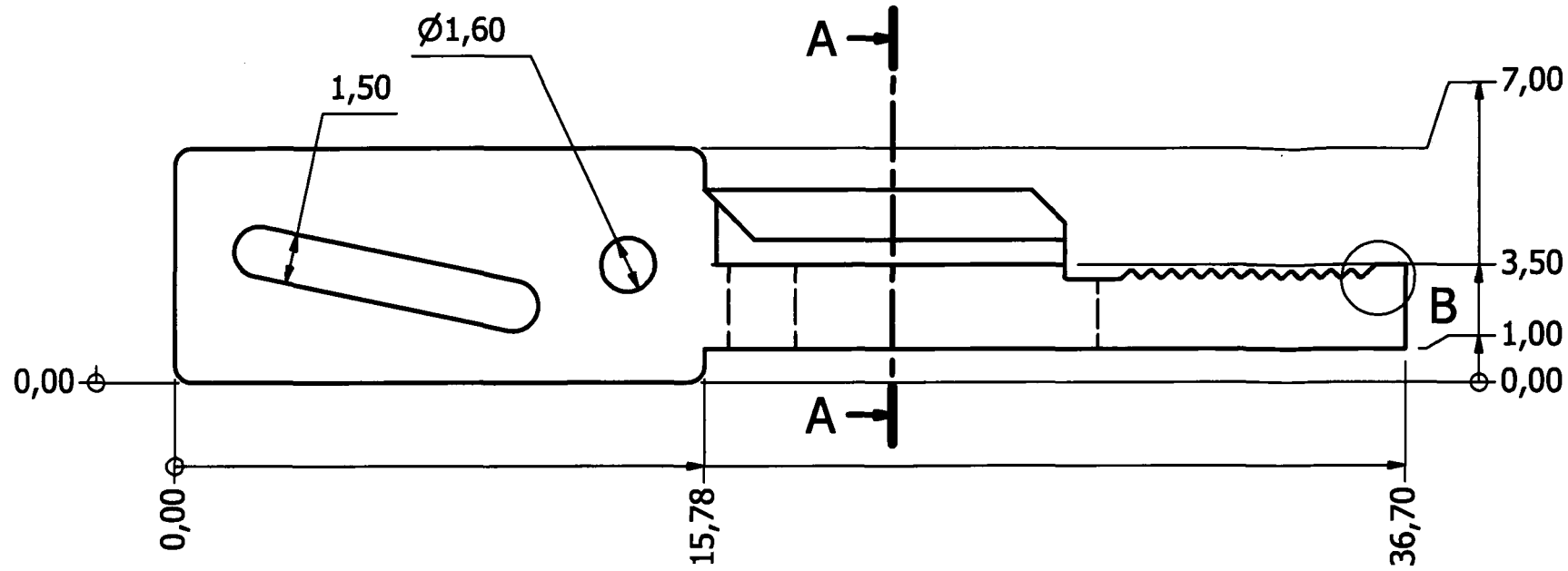
Mishra, R. K., 2008. *How do scissors work?*, World Laparoscopy Hospital <http://www.laparoscopyhospital.com/PR03.HTM> [Online].

Pierce, J., 1999. *Micro Traumatic Tissue Manipulator Apparatus*. United States Patent, Patent No. 5893878.

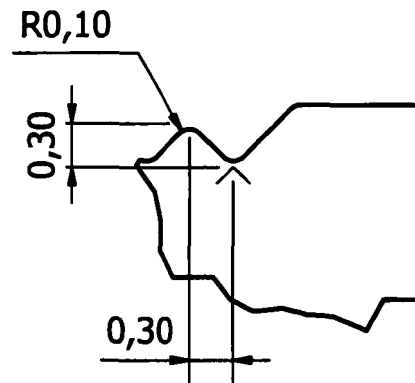
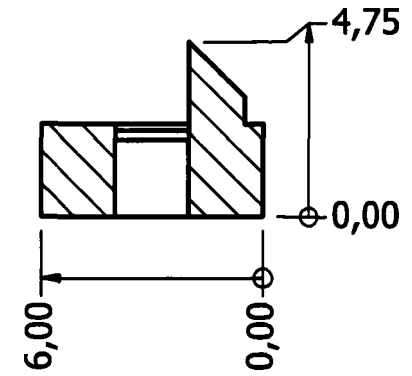
Slater, C., 1993. Laparoscopic Hook Scissors. United States Patent, Patent No. 5,203,785.

Yoon, I., 1999. Multifunctional Grasping Instrument with Cutting Member and Operating Channel for use in Endoscopic and Non-Endoscopic Procedures. United States Patent, Patent No. 5,984,939.

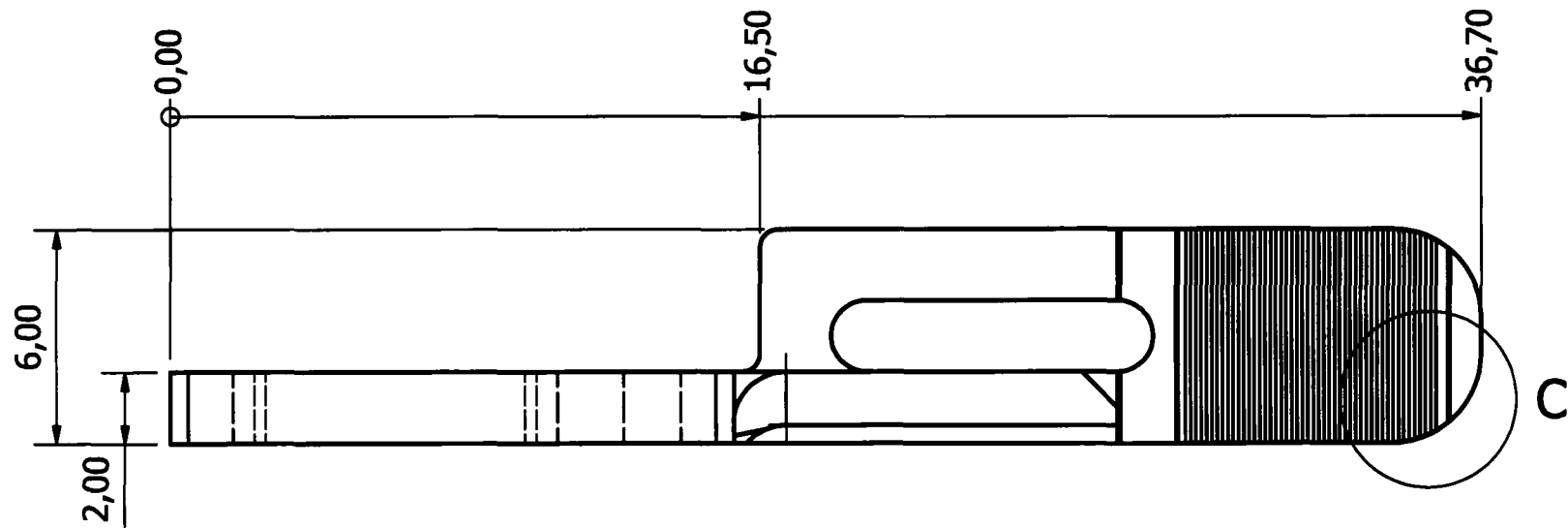
9.0 Appendix A – Detailed Drawings



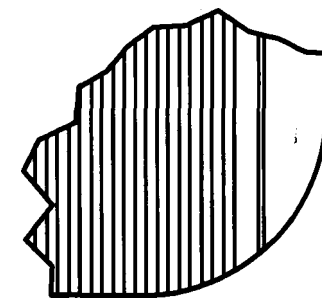
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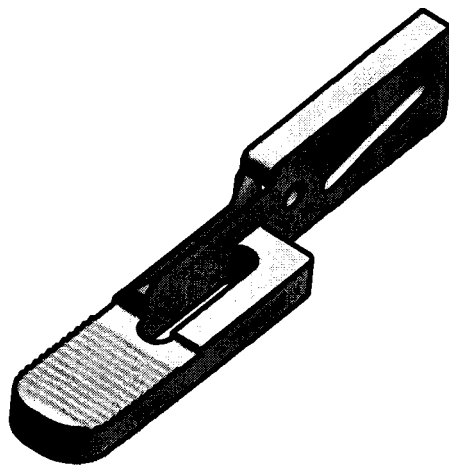
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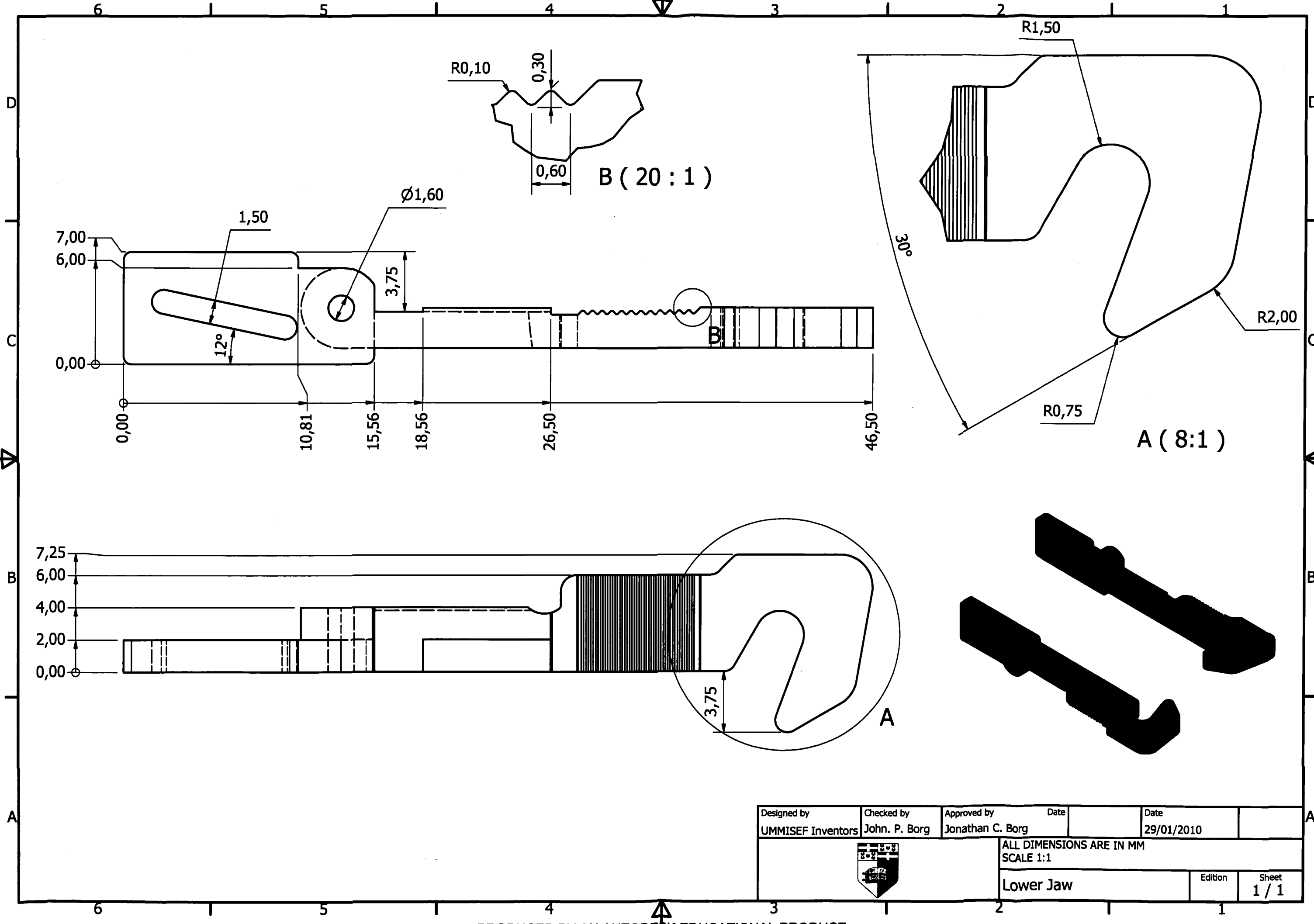
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C (10 : 1)




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| Designed by UMMISEF Inventors | Checked by John. P. Borg | Approved by Jonathan C. Borg | Date 29/01/2010 | Date 29/01/2010 |
|  | | | ALL DIMENSIONS ARE IN MM SCALE 1:1 | |
| Truncated Upper Jaw | | | Edition | Sheet 1 / 1 |



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|  | | | ALL DIMENSIONS ARE IN MM SCALE 1:1 | |
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