

# STANDARD SPECIFICATIONS FOR GROUNDNUT DIGGER

## 1 SCOPE

- 1.1 This standard specifies the material, dimensions, manufacturing and other requirements of major/critical components/sub-assemblies and replacement parts of tractor rear mounted groundnut digger to ensure proper quality control measures in the manufacture of these implements.
- 1.2 This standard is related to trade and manufacturing practices prevailing in the country and therefore, permits the purchaser to use his option for selecting the implement to suit his requirements.

## 2 NORMATIVE REFERENCES

The following standards/technical and test reports contain provisions which, through reference in this text, constitute provisions of PS ---/2018. At the time of publication, the report indicated was valid. All the normative references listed below are subject to revision, and parties to agreement, based on this part of PS ---/2018 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below;

- i) AMRI/2/79: Catalogue of improved locally developed agricultural implements of Pakistan.
- ii) IS 11235 – Test code for Groundnut digger, Animal drawn (Revised 2002).
- iii) PS 1650/1/1984: Specification for Agricultural Wheeled Tractors – Three point linkage – Part 1: Categories 1, 2 and 3.
- iv) ISO 530-1:1994(E): Agricultural tractors – Rear-mounted three-point linkage – Part 1: Categories 1, 2, 3 and 4.
- v) PS 1808/86: Agricultural wheeled tractors – Three-point linkage – Linchpins.
- vi) PS 877/72: The provision of safety on farm implements.
- vii) ASAE S318.9/SAE J208d: Safety for Agricultural equipment.

## 3 DEFINITIONS

For the purpose of this Pakistan Standard, the following definitions shall apply.

- 3.1 **Groundnut digger:** tractor rear mounted equipment used for digging groundnut crop. The equipment consists of a blade, shaker bars, coulters and clod breaker. Blade digs out the crop while the shaker bars vibrate the harvested crop to remove soil attached to the pods. Coulters cut the wines to prevent their inter tangling with the un-cut crop. The clod breaker crushes larger clods attached with the pods to facilitate cleaner harvest.

3.2 **Linkage Categories:** Linkage categories have been standardized through PS 1650/I/1984 as per tractor drawbar power which helps in selecting matching size of implements with tractor drawbar power. Recommended size of implement to be used with specified tractor drawbar power and associated category of three point linkage system of the tractor is shown below;

Linkage Category	Tractor drawbar power		Recommended size of implement
	kW	HP	
1	15-35	20-45	1800 -2130 mm (6-7 ft)
2	30-75	40-100	1800 -2130 mm (6-7 ft)
3	60-168	80-225	1800 -2130 mm (6-7 ft)

3.3 **Three point linkage assembly:** Combination of one upper link and two lower links, each articulated to the tractor and the implement at the opposite ends in order to connect the implement to the tractor.

3.4 **Three-point hitch assembly:** Combination of implement mast (providing yoke with hole for insertion of upper hitch attachment) and two lower hitch attachments on the implement, each used to connect tractor links with the implement rigidly.

3.5 **Upper hitch attachment:** Pin, usually detachable and forming part of the upper link assembly, by which an upper link is secured.

3.6 **Lower hitch attachment:** Pin, or clevis and pin, usually attached to the implement, by which a lower link is secured.

3.7 **Hitch point:** Articulated connection between link and implement.

3.8 **Mast:** Component of the implement that provides location of the upper hitch point on the implements.

3.9 **Linchpin:** Pin, usually fitted with a spring retaining device, by which an articulated connection is retained in position.

3.10 **Lower hitch attachment span:** Distance between the shoulders of the lower hitch pins or inner faces of the clevis prongs against which the sides of the lower link socket ball joints abut.

3.11 **Mast height:** Vertical distance between the center line of the upper hitch point and the common axis of the lower hitch points.

3.12 **Mounted Implement:** An implement which is directly attached with the tractor by connecting three point linkages and three point hitch. During transportation, implement is lifted by the three point linkage with the help of tractor hydraulic system.

3.13 **Mild Steel (MS):** Steel with low carbon contents in the range of 0.05%-0.25% carbon by weight. It is commonly used for implement frame, mast and other non-wearing and structural components of the implements.

- 3.14 **Medium Carbon Steel (MCS):** Steel with medium carbon contents in the range of 0.29%-0.54% by weight. It is commonly used for soil working and wearing components of the implements.
- 3.15 **High carbon steel (HCS):** Steel with high carbon content in the range of 0.6-1.5% by weight. Due to the higher carbon content compared to low and medium carbon steels, the high carbon steel has higher hardness, is wear resistant but has lower ductility, lower weldability and higher brittleness. It is commonly used in springs and wires etc.
- 3.16 **Spring steel (SS):** These steels are generally low-alloy manganese, medium-carbon steel or high-carbon steel with a very high yield strength.
- 3.17 **Frame:** Rigid structure to which different components of the implement are attached.
- 3.18 **Working width:** The working width of the groundnut digger for different categories of tractor drawbar power shall be as specified under sub clause 2.1.

#### **4 DIMENSIONAL, MATERIAL AND MANUFACTURING REQUIREMENTS**

*Note: All dimensions are in mm and minimum, except where tolerances are specified.*

##### **4.1 Frame and three-point hitch assembly (Figure 1)**

Frame and three-point hitch assembly of a typical groundnut digger is shown in Figure 1(a).

##### **4.1.1 Frame assembly**

- 4.1.1.1 Frame assembly shall consist of frame structure, side plates, mast mounting structure, frame support rods, coulter rod mounting bracket and clod breaker roller hitching bracket.
- 4.1.1.2 Frame structure shall be made from 02 Nos. M.S angles welded to form a T section. Upper angle shall be 75 x 75 x 9 mm and lower angle shall be 60 x 60 x 6 mm.
- 4.1.1.3 Both T sections shall be strengthened by welding MS flat pieces of 50 x 5 mm spaced 50 mm apart.
- 4.1.1.4 Side plate shall be made from MS plate 140 x 10 mm which shall be welded to the frame T sections at both ends.
- 4.1.1.5 Mast mounting structure shall be made from MS angle 62 x 62 x 8 mm which shall be welded to the main frame beams.
- 4.1.1.6 Frame support rods shall be made from MS of diameter 16 mm.
- 4.1.1.7 Coulter mounting brackets shall be made from MS box 65 x 65 x 5 mm.
- 4.1.1.8 Clod breaker roller hitching bracket MS plate 65 x 9 mm (optional)

##### **4.1.2 Three point hitch assembly**

Three point hitch assembly shall conform to provisions of provisions of PS 1650/1/1984 and ISO 530-1:1994(E) and shall consist of a mast yoke to connect upper hitch point and two lower hitch attachments to connect lower hitch points with the implement.

## Mast

- 4.1.2.1 Mast shall be made from formed MS sheet 9 mm thick which shall be welded with the mast mounting structure.
- 4.1.2.2 The mast yoke shall be reinforced with 9 mm M.S washer around pin hole area.
- 4.1.2.3 Width between inner faces of yoke ( $W_1$ ), width between outer faces of yoke ( $W_2$ ) and diameter of hitch pin hole ( $D_1$ ) shall have dimensions as specified in Table 1.

## Lower hitch attachments

- 4.1.2.4 Lower hitch attachment may be of pin type.
- 4.1.2.5 The lower hitch attachment shall be mounted on MS box measuring 140 x 50 x 9 mm which shall be welded to the main frame beam at the front.
- 4.1.2.6 Lower hitch attachment mounting box shall be welded to at a place to ensure that mast height ( $H_1$ ) and span of lower hitches ( $S$ ) shall be as specified in Table 1.
- 4.1.2.7 Diameter of lower hitch attachment hole ( $D_2$ ) shall have dimensions as shown in Table 1.

*Note: Vital dimensions of three point hitch assembly are shown in Figure 1(b).*

## 4.2 Upper hitch attachment, lower hitch attachment and linchpin (Figure 2)

- 4.2.1 Upper hitch attachment, lower hitch attachment and linchpin shall be made from cold drawn MS which shall be zinc coated to make these corrosion resistant.
- 4.2.2 Upper hitch attachment and lower hitch attachment for different categories of three point linkage systems shall have dimensions as specified in Table 2.
- 4.2.3 Linchpin for different categories of three point linkage systems shall conform to provisions of PS 1808/86 and shall have dimensions as specified in Table 3.

**Table 1: Vital dimensions of three-point hitch assembly**

Dimension	Cat1		Cat2		Cat3	
	Min.	Max.	Min.	Max.	Min.	Max.
<b>Mast</b>						
Width between inner faces of yoke ( $W_1$ )	44.5	-	52.0	-	52.0	-
Width between outer faces of yoke ( $W_2$ )	-	69	-	86	-	95
Diameter of upper hitch attachment hole ( $D_1$ )	19.30	19.32	25.70	25.72	32.00	32.25
Mast height (H)	460 ± 1.5		610 ± 1.5		685 ± 1.5	
<b>Lower hitch attachment</b>						
Diameter of lower hitch attachment hole ( $D_2$ )	22.40	22.73	28.70	29.03	37.40	37.75
Span of lower hitch attachments (S)	683 ± 1.5		825 ± 1.5		965 ± 1.5	

**Table 2 (a): Upper hitch attachment dimensions**

Dimension	Cat 1	Cat 2	Cat 3
Diameter of upper hitch attachment (B)	18.97 - 19.00	25.27 - 25.40	31.50 - 31.75
Linchpin hole distance (A)	76 min	93 min	102 min
Diameter of linchpin hole (C)	12	12	12

**Table 2 (b): Lower hitch attachment dimensions**

Dimension	Cat 1	Cat 2	Cat 3
Diameter of lower hitch attachment (B)	21.79 - 22.00	27.79 - 28.00	36.40 - 36.50
Linchpin hole distance (A)	39 min	49 min	52 min
Diameter of linchpin hole (C)	12	12	17

**Table3: Linchpin dimensions**

Dimension	Cat 1	Cat 2	Cat 3
Linchpin length (A)	32	32	32
Diameter of Linchpin (B)	11	11	16
Diameter of Linchpin wire (C)	3	3	3

**4.3 Blade assembly (Figure 3)**

- 4.3.1 Blade assembly shall consist of blade mounting plates, blade body, cutting edge, shaker rods and clod breaker mounting brackets.
- 4.3.2 Blade mounting plates shall be made from MS plate 12 mm thick.
- 4.3.3 Blade body shall be made from MS plate 25 mm thick with **hardness 25 HRC**.
- 4.3.4 Cutting edge shall be made from forged MCS which shall be welded underneath the blade body **having hardness 45 HRC**.
- 4.3.5 Shaker rods shall be formed and made from spring steel of diameter 16 mm.
- 4.3.6 Clod breaker mounting brackets shall be made from U shaped MS plate measuring **40 x 10x150 mm**, which shall be welded to side plates.

**4.4 Coulter rod assembly (Figure 4)**

- 4.4.1 Coulter rod assembly is optional, if provided, it shall consist of coulter rod, coulter rod lifting/lowering hook and hub sub-assembly.
- 4.4.2 Coulter rod shall be made from MS box measuring 50 x 50 x 4 mm and shall be provided with a hook made from MS rod of appropriate size to facilitate rod lifting and lowering to adjust height of coulter.
- 4.4.3 Coulter rod lifting/lowering hook shall be made from MS round 10 mm.
- 4.4.4 Hub sub-assembly shall consist of hub, pin and bearings.

- 4.4.4.1 Hub shall be made from CI which shall be machined to accommodate bearings 6206
- 4.4.4.2 Hub pin shall be made from MS round machined to accommodate specified bearings.
- 4.5 **Coulter blade**
- 4.5.1 Coulter blade shall conform to PS 963 – 1983 (first revision) in terms of parameters as described below;
- 4.5.2 *Type*: the disc blade shall be flat disc of type A.
- 4.5.3 *Material*: Disc shall be made from one of the following materials;
- (1) Plain carbon steel with a minimum carbon content of 0.7%;
  - (2) Silicon – manganese steel;
  - (3) Alloy/boron steel
- 4.5.3.1 *Hardness*: The hardness of the disc shall HRC 35.7 – 46.7.
- 4.5.3.2 *Area of hardness*: Hardened area of the disc shall cover the entire surface of the disc.
- 4.5.3.3 *Cutting edge beveling*: Disc blade shall have the cutting edge beveled on both sides. The thickness of the beveled edge shall not be more than 0.8 mm.
- 4.5.3.4 *Flatness*: Distortion of the disc blade shall not exceed 1.6 mm when placed on a flat surface.
- 4.6 **Coulter blade dimensions (Figure 5)**
- 4.6.1 Coulter disc blade dimensions such as nominal diameter, P.C.D, diameter of fixing holes, central hole diameter, number of fixing holes and thickness shall be as given below.
- 4.6.1.1 *Nominal diameter*: Nominal diameter of the discs ( $D_1$ ) to be used as coulter shall be  $350 \pm 10$  mm.
- 4.6.1.2 *Central hole diameter*: The diameter of central hole ( $d$ ) shall be 32 mm.
- 4.6.1.3 *Pitch Circle Diameter (PCD)*: The PCD ( $D_2$ ) shall be 92 mm.
- 4.6.1.4 *Fixing holes diameter*: The fixing holes shall be round and of countersunk type. Diameter of round fixing countersunk holes ( $D_3$ ) shall be 6.6 mm. There shall be 4 or 5 fixing holes which shall be equally spaced.
- 4.6.1.5 *Thickness*: The thickness of the coulter disc blade (B) shall be 2.4 to 4.0 mm.
- 4.7 **Clod breaker assembly (Figure 6)**
- 4.7.1 Clod breaker assembly is optional, if provided shall consist of a drum sub-assembly and coupling arms.
- 4.7.2 Drum sub-assembly shall consist of a drum, clod breaker edges, side plates, hub plates, hub, pin and bearings.
- 4.7.2.1 Drum shall be made from MS sheet 6 mm thick and shall have diameter 200 mm.

- 4.7.2.2 Clod breaker edges shall be made from MS angle (18 Nos.) measuring 25 x 25 x 4 mm which shall be welded to drum in triangular form.
- 4.7.2.3 Side plates shall be made from MS sheet 10 mm thick which shall be welded to drum from inner side.
- 4.7.2.4 Hub plate shall have diameter of 80 mm and shall be made from MS sheet 15 mm thick which shall be bolted to drum side plate.
- 4.7.2.5 Hub shall be made from CI/CS to accommodate 6305 bearing.
- 4.7.2.6 Pin shall be made from 30 mm MS round machined to accommodate specified bearings (see clause 4.7.3).
- 4.7.3 Coupling arms (02 Nos.) made from MS box 52 x 52 x 5 mm with bush at front end with 24 mm hole.

## **5 OTHER REQUIREMENTS**

- 5.1 All the structural components shall be manufactured by using new materials.
- 5.2 All the market items like pipes, nuts and bolts shall be brand new.
- 5.3 Nuts and bolts shall be zinc coated.
- 5.4 Overall size and weight of the groundnut digger shall be declared by the manufacturer.
- 5.5 All the components/sub-assemblies shall be welded at right angle and parallel members of the frame shall be of equal length and size.
- 5.6 In case of bolting of mast to frame through mast mounting bracket, bolts of size M 12 shall be used.
- 5.7 All the nut bolt fastenings shall be tightened at appropriate torque using imported spring washers.
- 5.8 Operation and maintenance (O&M) manual shall be provided in English & Urdu with complete illustrations of assembling of replaceable components.
- 5.9 O&M manual shall also contain relevant safety instructions as provided in PS 877:1972 and ASAE S318.9/SAE J208d.
- 5.10 A set of pins with linchpins and two adjustable wrenches of 250 mm and 300 mm size should also be provided.
- 5.11 The frame shall be rigid and strong. The frame members shall be welded perfectly at right angle. All the members of the frame shall be of equal length and size.
- 5.12 The implement shall be painted preferably using baking/stoving paint with primer.

## **6 FINISH AND WORKMANSHIP**

- 6.1 All components of the groundnut digger should be free from pits, burrs and other visual defects.

- 6.2 The welding of various parts shall be satisfactory in all respects.
- 6.3 All the weld-ments shall be smoothed by grinding.
- 6.4 All the exposed parts shall have protective coating to prevent surface from rusting and to avoid deterioration in transit and during storage.

## **7 MARKING AND PACKING**

- 7.1 Each groundnut digger shall be marked with the following particular:
  - 7.1.1 Manufacturer's name, address, contact numbers and trade-mark, if any;
  - 7.1.2 Maximum size and number of tines; and
  - 7.1.3 Batch or code number.
- 7.2 The particulars listed under 7.1.1, 7.1.2 and 7.1.3 shall be stamped embossed or engraved on metallic plate and rigidly fitted on a non-wearing part of the groundnut digger.
- 7.3 Each groundnut digger may also carry the PSQCA Certification Mark subject to verification by the competent authority.
- 7.4 The groundnut digger should be packed to ensure safety of the components in transportation as agreed to between the purchaser and the manufacturer/supplier.

*Note: Design of a typical groundnut digger is shown in Figure 7. The design can be modified as agreed between the purchaser and the manufacturer subject to compliance of these standard specifications.*



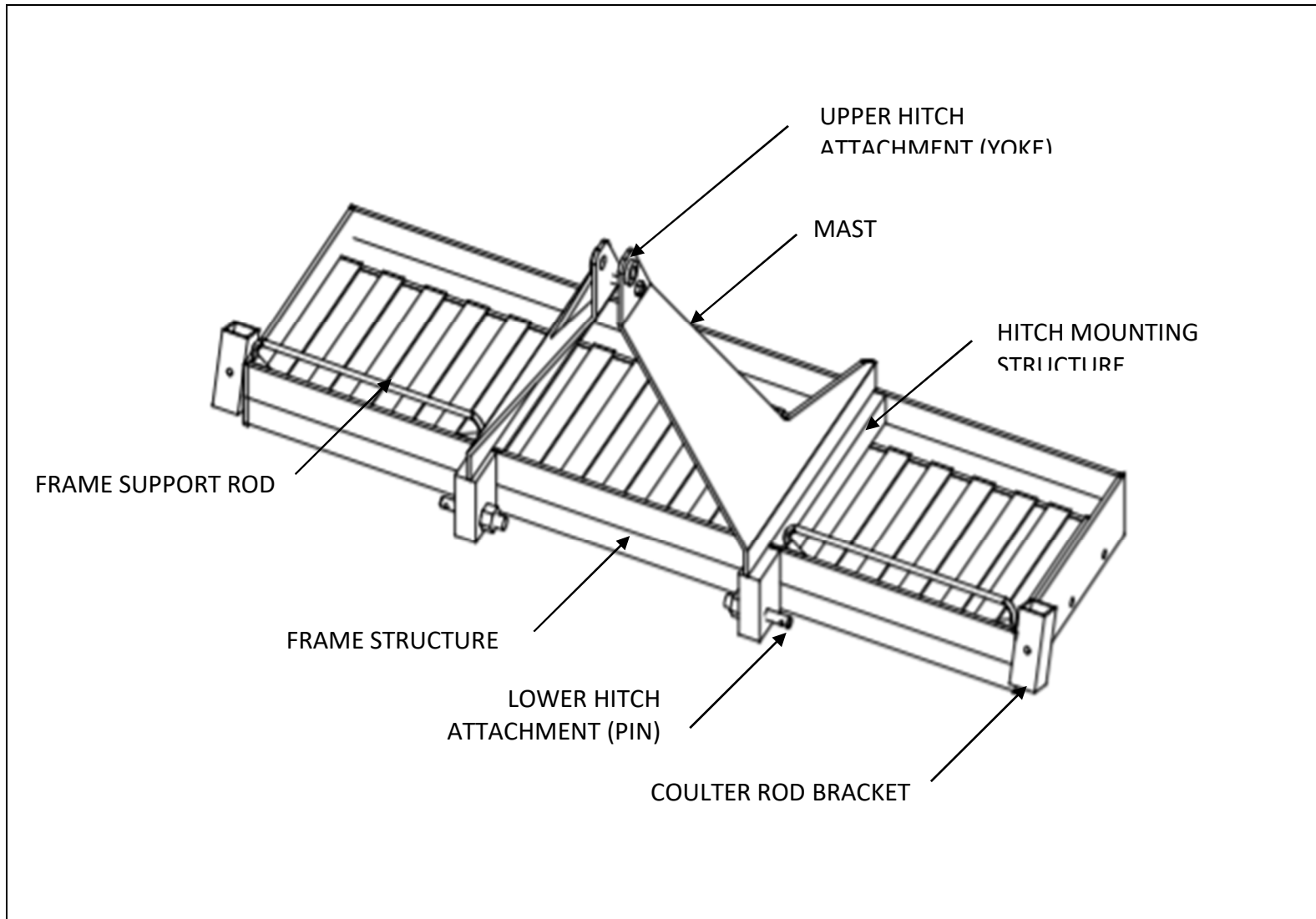


Figure 1(a): Frame and three-point hitch assembly

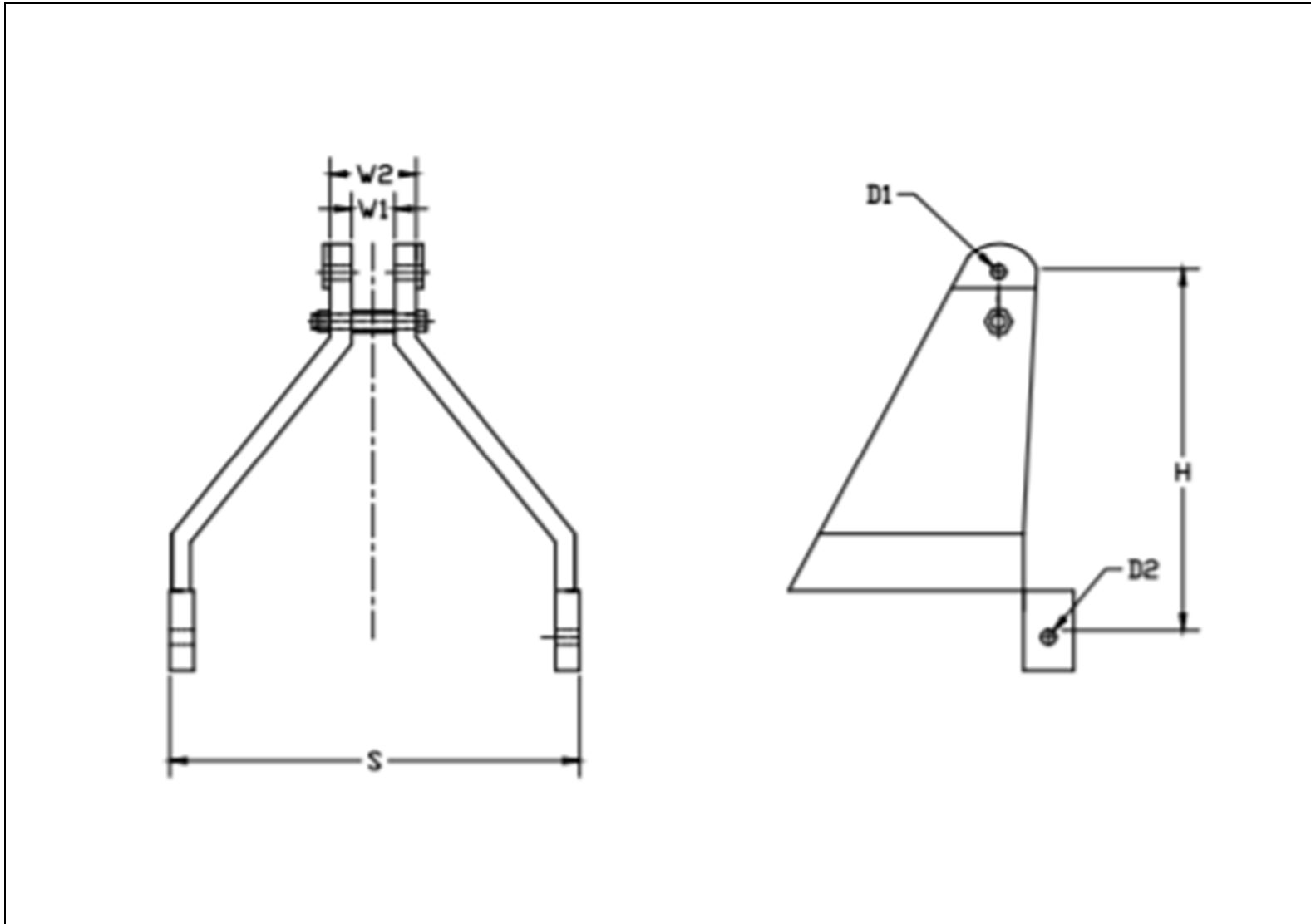


Figure 1(b): Three point hitch dimensions

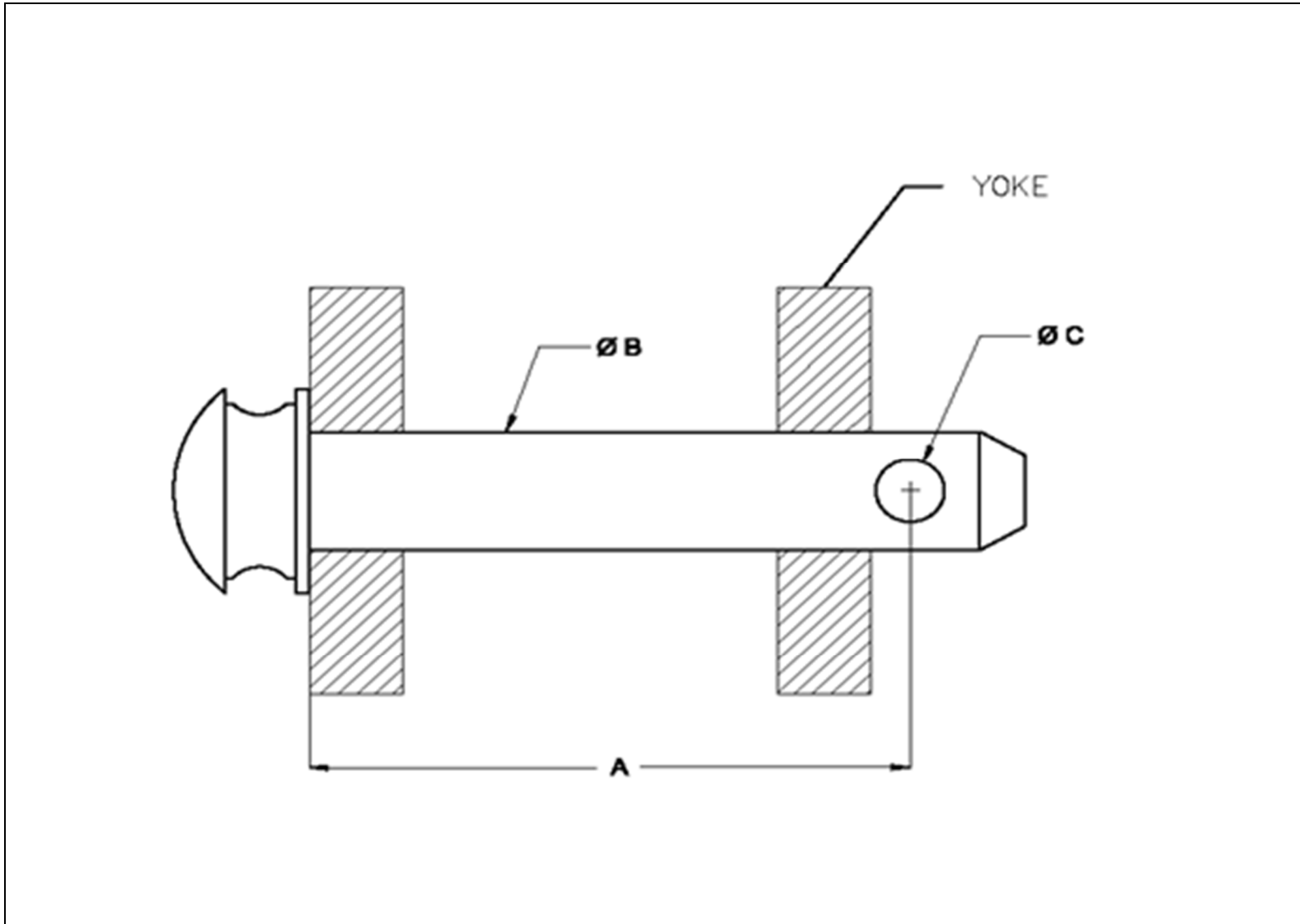


Figure 2 (a): Upper hitch attachment dimensions

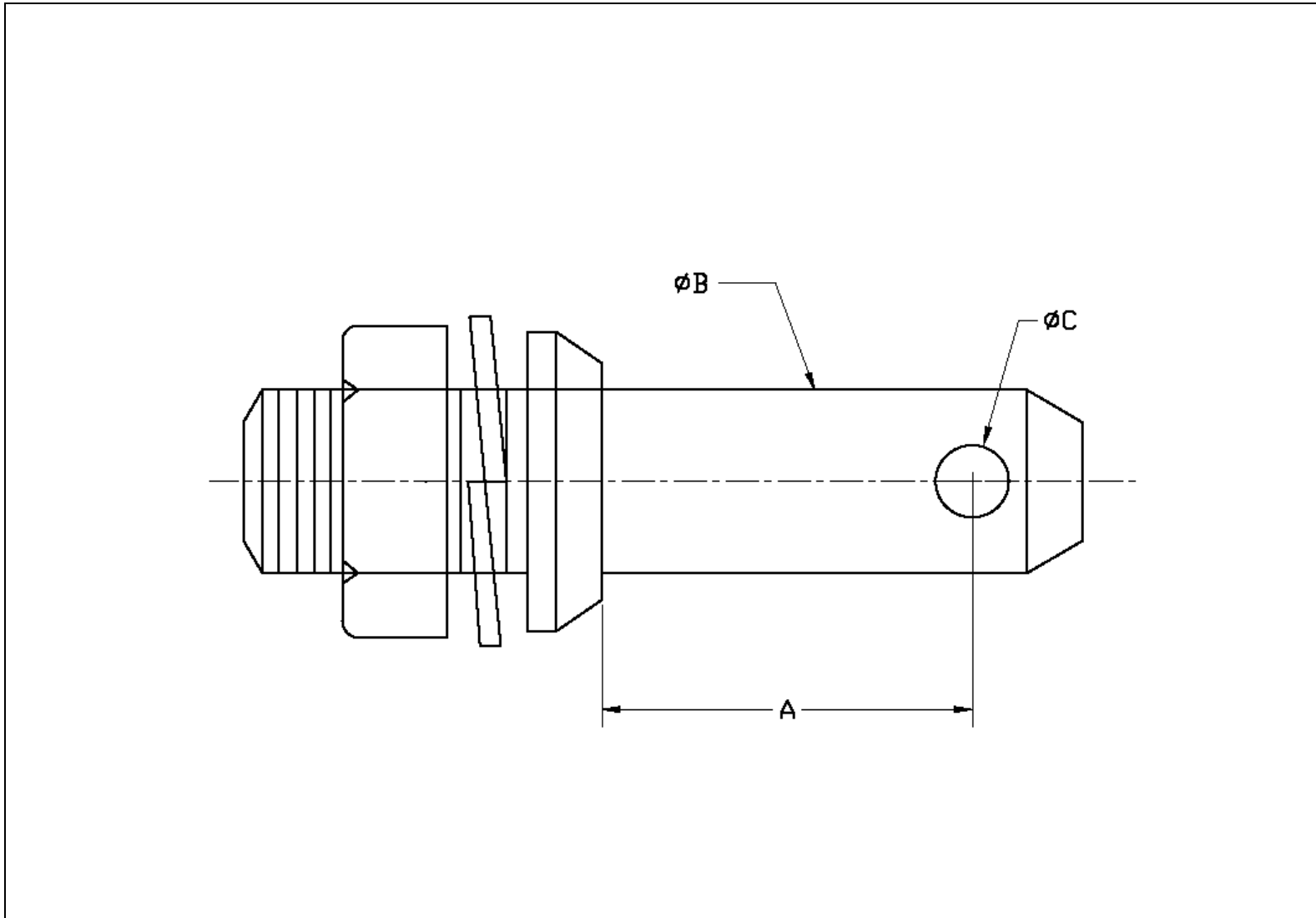


Figure 2 (b): Lower hitch attachment dimensions

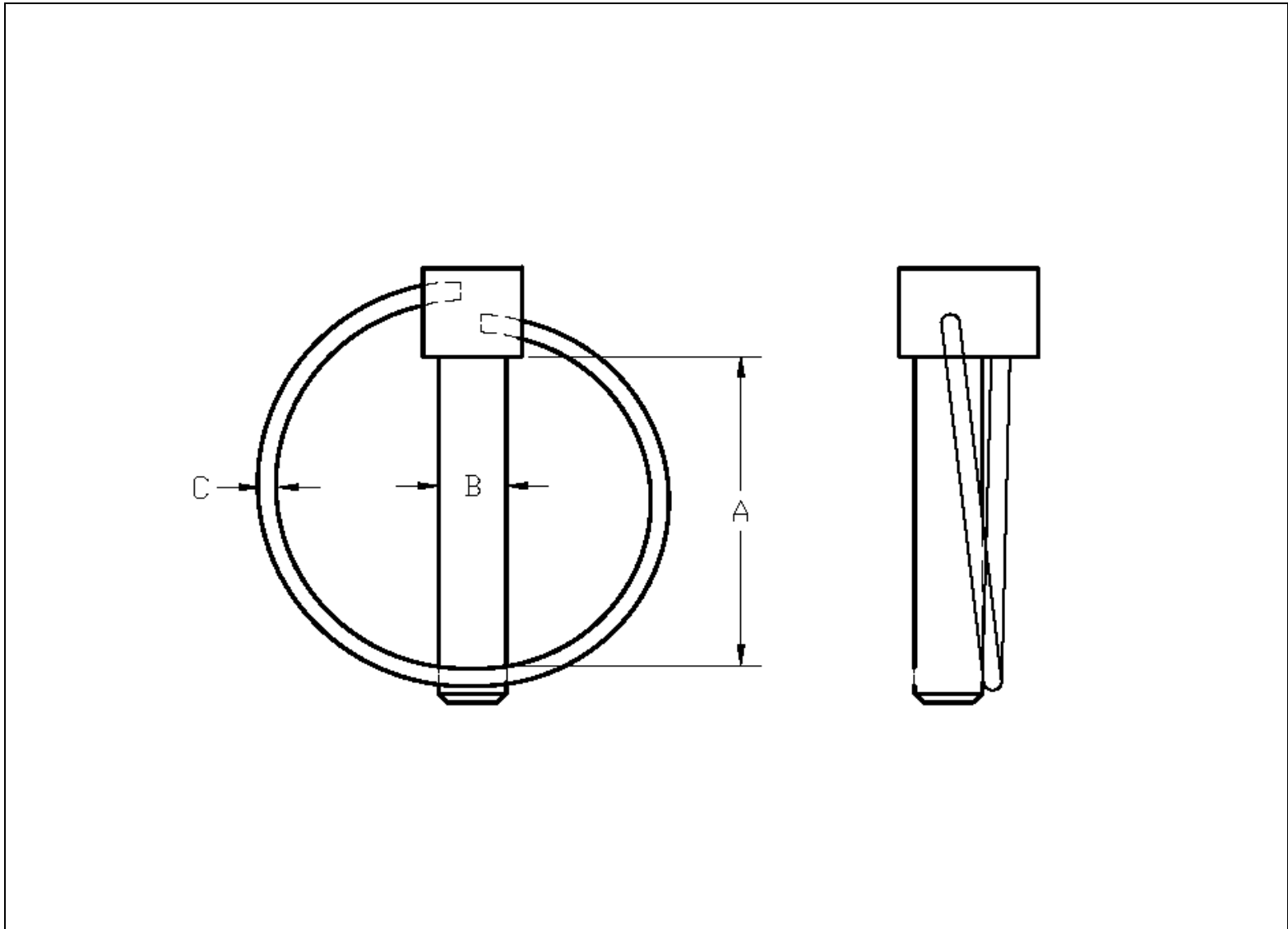


Figure 2 (c) Lynchpin dimensions

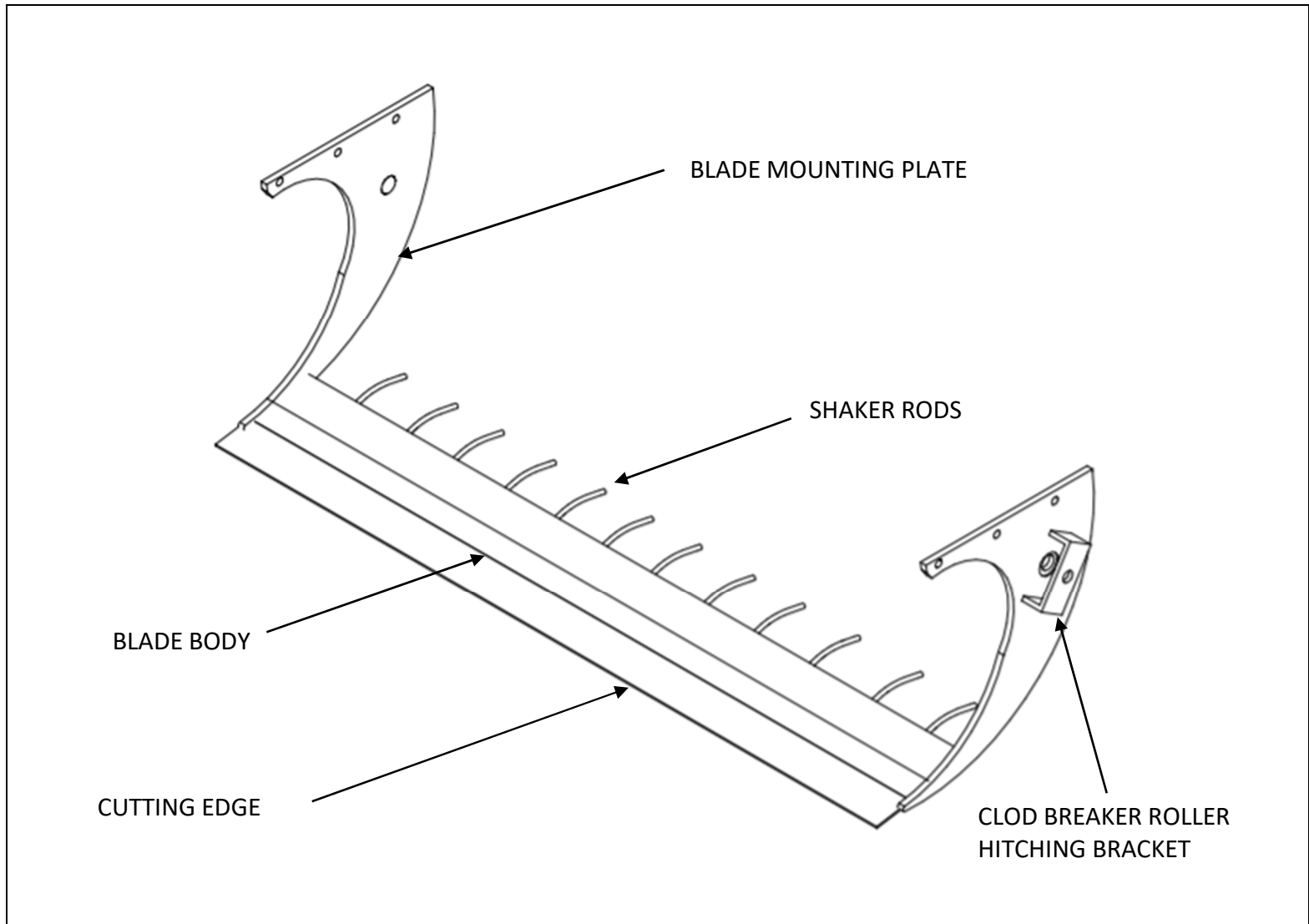


Figure 3 (a): Blade assembly

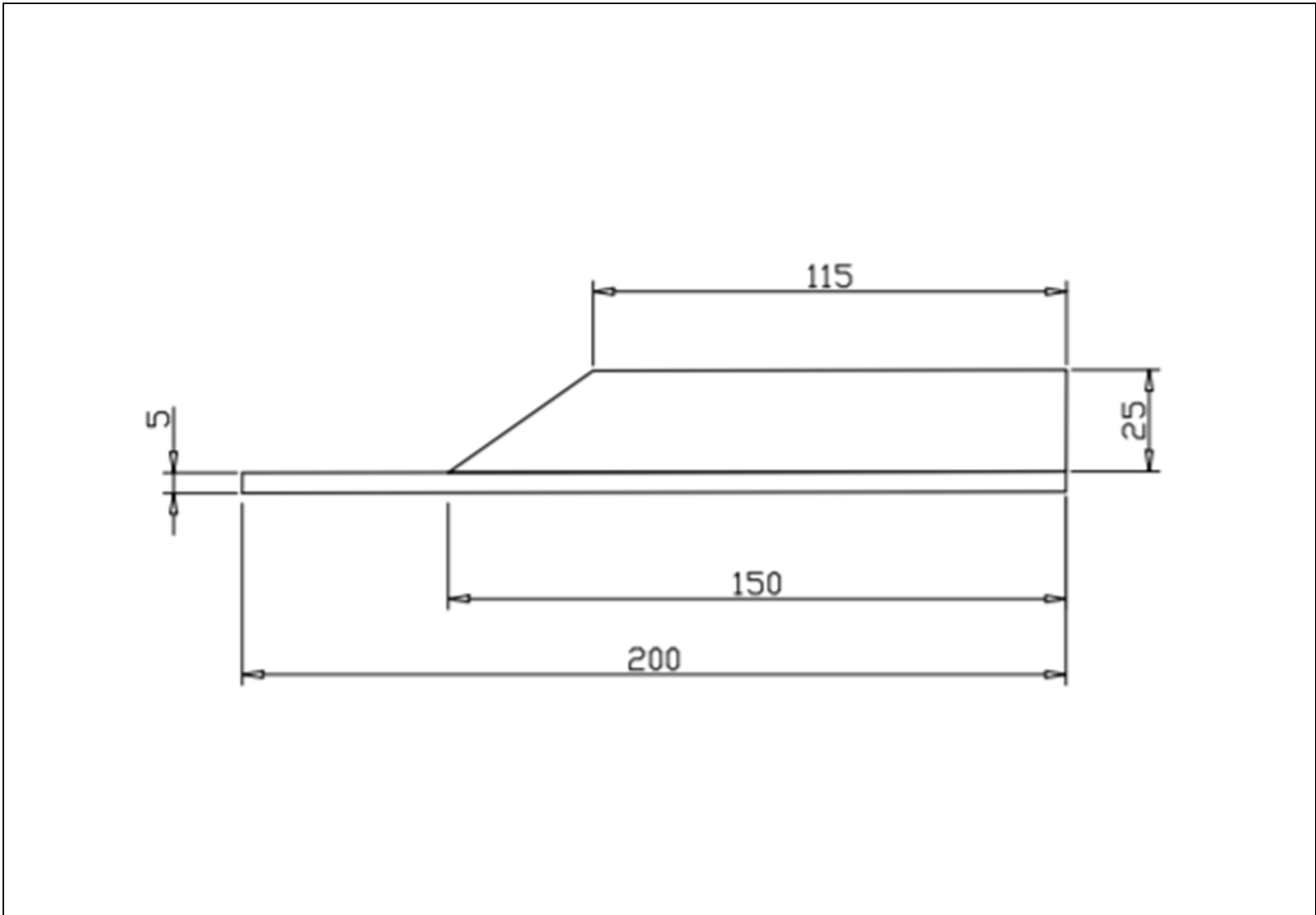


Figure 3 (b) Blade body and cutting edge dimensions

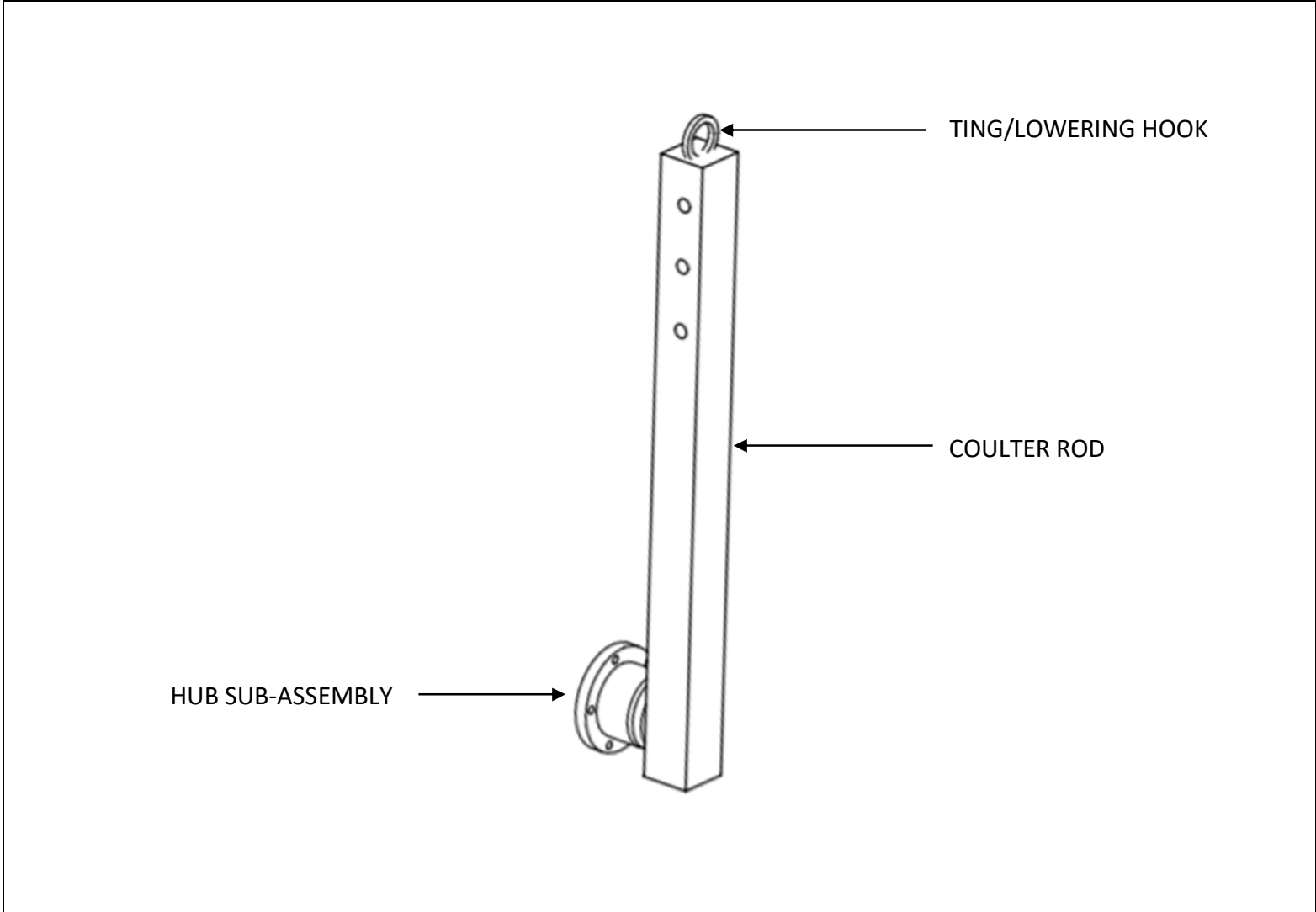


Figure 4: coultter rod assembly



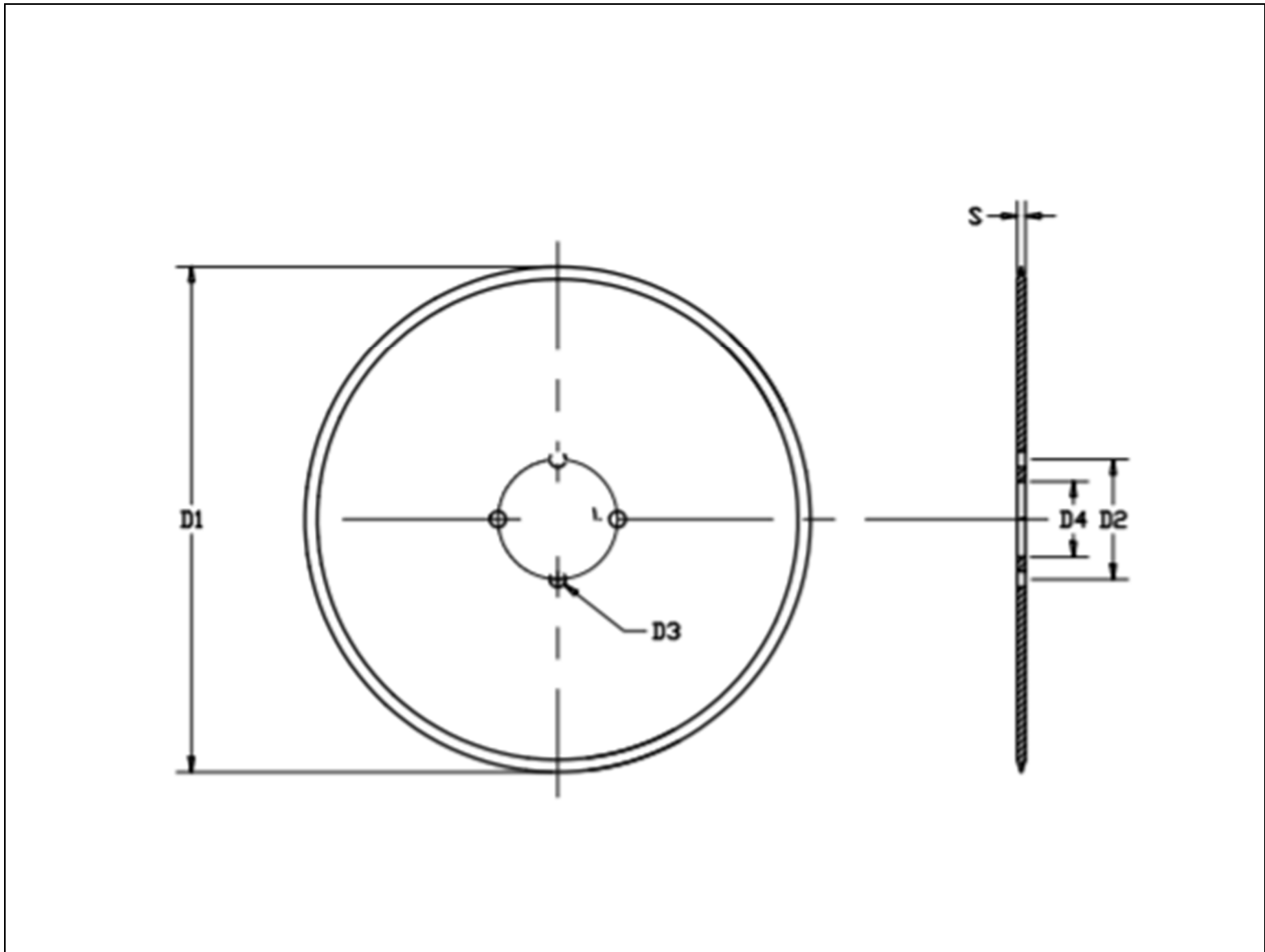


Figure 5: Coultter blade dimensions

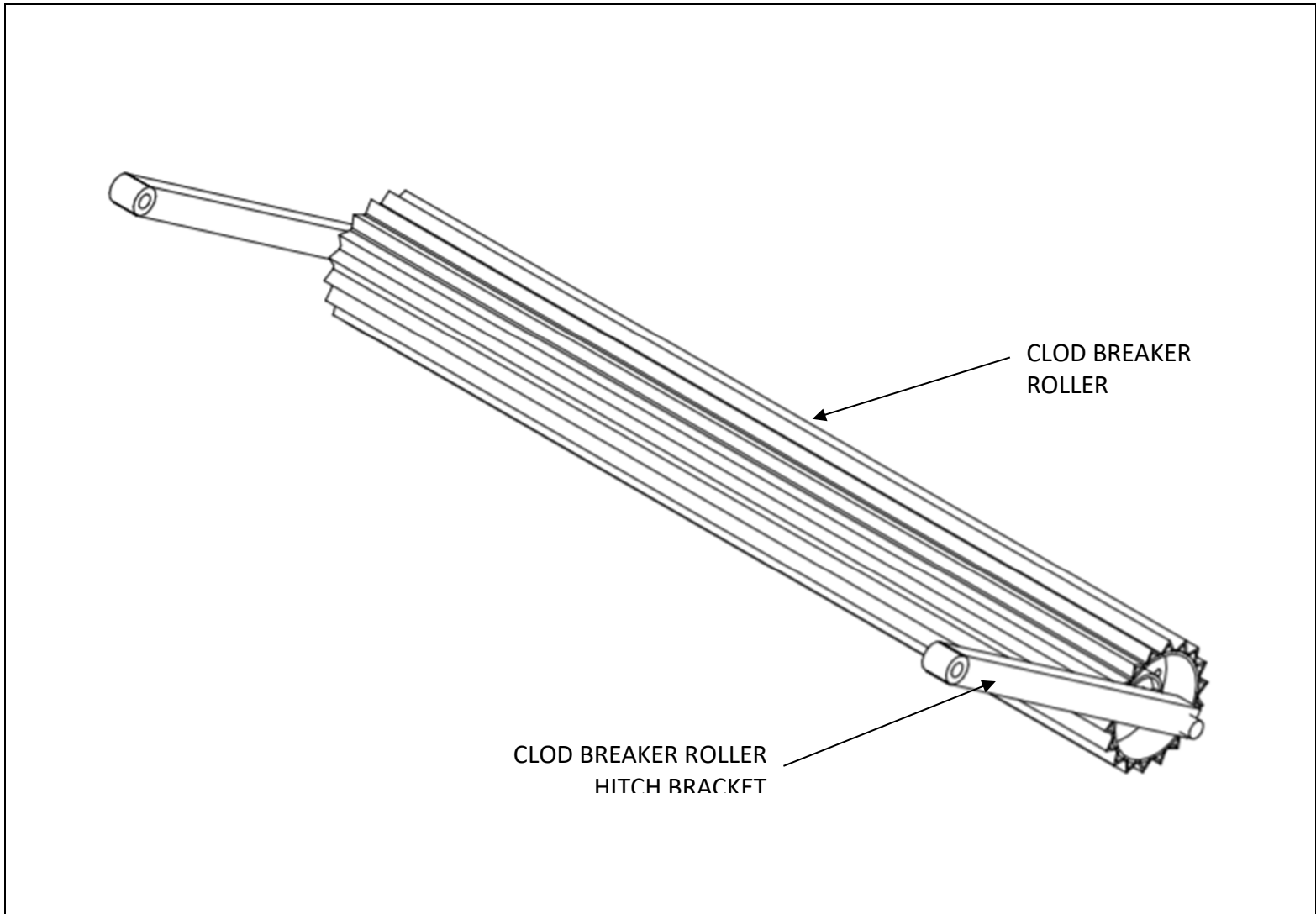


Figure 6: Clod breaker assembly

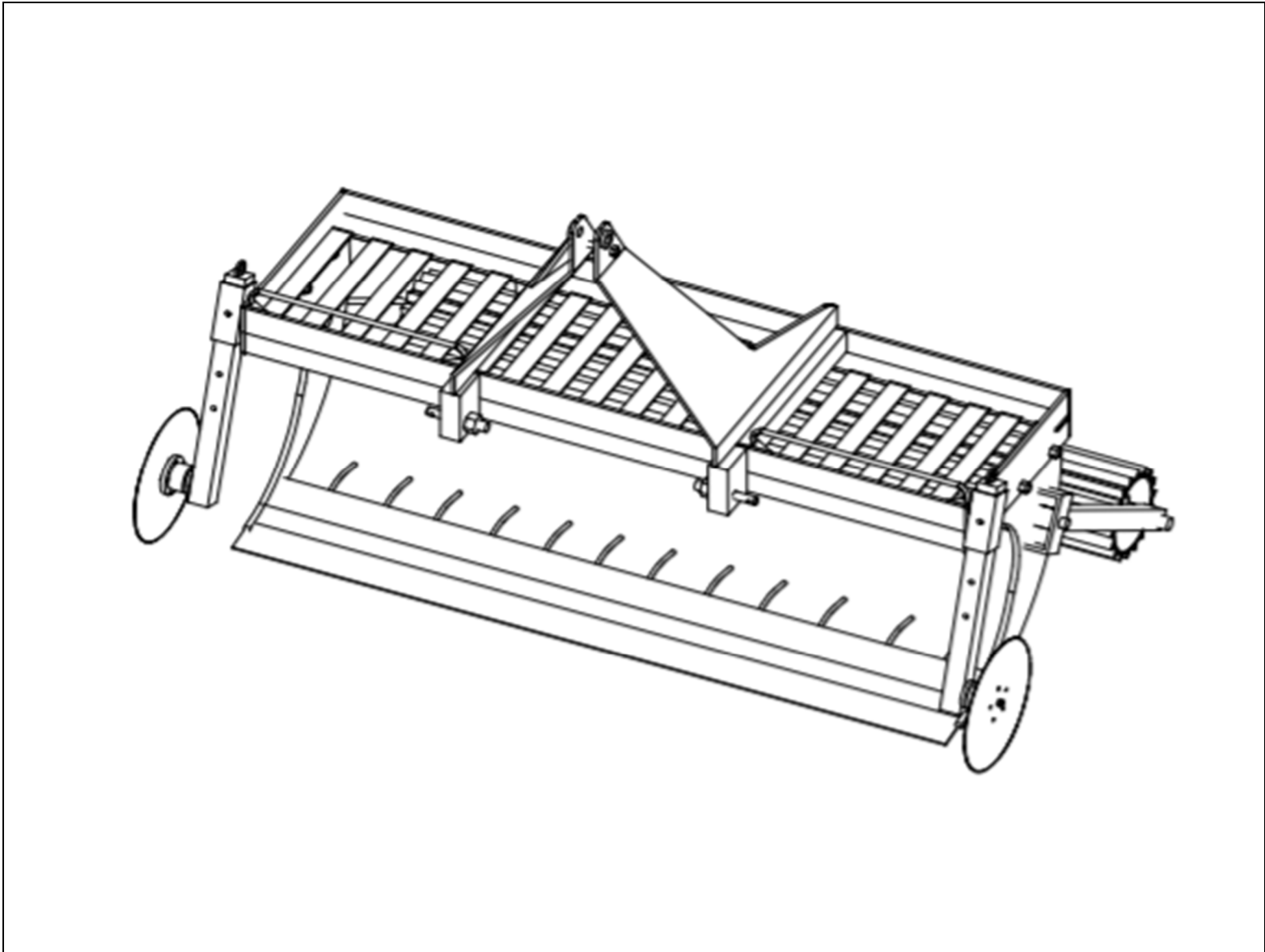


Figure 7: A typical groundnut digger