PAKSITAN STANDARD SPECIFICATIONS FOR POSTHOLE 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 posthole 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 contain provisions which, through reference in this text, constitute provisions of PS ----/2018. At the time of publication, the edition 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) ISO 530-1:1994(E): Agricultural tractors – Rear-mounted three-point linkage – Part 1: Categories 1, 2, 3 and 4.

ii) PS 1650/1/1984: Specification for Agricultural Wheeled Tractors – Three point linkage – Part 1: categories 1, 2 and 3.

iii) PS 1808/86: Agricultural wheeled tractors – Three-point linkage – Linchpins.

iv) PS 877/72: The provision of safety on farm implements.

v) ASAE S318.9/SAE J208d: Safety for Agricultural equipment.

3 DEFINITIONS

For the purpose of this standard, the following definitions shall apply.

3.1 **Posthole digger:** A **t**ractor rear mounted machine comprising of an auger which is used to drill hole in soil for the purpose of plantation of tree sapling or insertion of wooden or concrete posts for fencing. The equipment is driven through tractor PTO shaft. The dug hole is of uniform circumference. The depth and diameter of dug hole depends of auger size and tractor power.

3.2 **Linkage Categories:** Linkage categories have been standardized through PS 1650/I/1984 and ASAE S318.9/SAE J208d 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 auger diameter
	kW	HP	
1	15-35	20-45	225 and 300 mm
2	30-75	40-100	455 and 605 mm
3	60-168	80-225	760 and 910 mm

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 **Link point:** Articulated connection between link and tractor.

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

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

3.11 **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.

3.12 **Mast height:** Vertical distance between the center line of the upper hitch point and the

3.13 **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.

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

3.15 **Frame:** Rigid structure to which different components of the implement are attached.

3.16 **Gear Box:** Most modern gearboxes are used to increase torque while reducing the speed of a prime mover output shaft. This means that the output shaft of a gearbox rotates at a slower rate than the input shaft, and this reduction in speed produces a mechanical advantage, increasing torque.

3.17 **Universal joint (U.J.):** A joint or coupling that allows parts of a machine not in line with each other limited free of movement in any direction while transmitting rotary motion.

3.18 **Auger**: An auger is a drilling device, or drill bit, that usually includes rotating helical screw blade to act as a screw conveyor to remove the drilled out material.

3.19 **Working Size:** Working size of the post hole digger shall be the size of the bore made in the soil.

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 posthole digger is shown in Figure 1(a).

4.1.1 Frame Assembly

4.1.1.1 The frame assembly shall consist of main frame structure, upper hitch mounting plate, lower hitch attachment mounting, gearbox coupler arm and auger carrying rack.

4.1.1.2 Frame structure shall be made from MS box 1830 ± 10 mm measuring at front 115 x 105 x 6 mm and at the rear 190 x 105 x 6 mm.

4.1.1.3 Upper hitch mounting plate shall be made from MS plate 25 mm thick and shall be 200 mm long which shall be welded to the main frame at front end.

4.1.1.4 Lower hitch attachment mounting shall be made from MS plate measuring 300 x 62 x 13 mm, which shall be welded to the main frame structure from the lower side of the main frame structure. It shall have 03 holes to accommodate 28 mm pin.

4.1.1.5 Gear box coupler arms shall be made from MS plate 62 x 13 mm welded to the frame and shall have a pin hole for 28 mm pin.

4.1.1.6 Auger carrying rack shall be made from 04 Nos. MS plates 6 mm thick. Carrying rack shall have 04 Nos. MS round bars 395 ± 5 mm long and 16 mm dia.

4.1.2 Three point hitch assembly

Three point hitch assembly shall conform to provisions of PS 1650/1/1984 and ISO 530-1:1994(E) and shall consist of an upper hitch mounting plate to be connected at upper link point to serve as top link and two lower hitch attachments to connect lower hitch points with the implement.

Upper hitch mounting plate

4.1.2.1 Diameter of upper hitch mounting plate hole (D_1) shall have dimensions as specified in Table 1.

Lower hitch attachments

4.1.2.2 Lower hitch attachment may be pin type.

4.1.2.3 Lower hitch attachment mounting structure shall be of inverted U type made from MS box measuring 100 x 55 x 6 mm which shall be connected to the main frame structure through coupling using a pin made from MS round 28 mm dia.

4.1.2.4 Lower hitch attachment hole dia. (D_2) shall have dimensions as shown in Table 1.

4.1.2.5 Lower hitch attachment pin holes shall be made at a place to ensure that span of lower hitch attachments (S) and mast height (H) shall be as specified in Table 1.

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

4.1.3 **Upper hitch attachment, lower hitch attachment and linchpin (Figure 2)**

4.1.3.1 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.

4.1.3.2 Upper hitch attachment for different categories of three point linkages shall have dimensions as specified in Table 2.

4.1.3.3 Lower hitch attachments for different categories of three point linkages shall have dimensions as specified in Table 2.

4.1.4 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	Cat 1		Cat 2		Cat 3	
	Min.	Max.	Min.	Max.	Min.	Max.
Upper hitch mounting plate						
Diameter of upper hitch mounting plate hole (D_1)	19.30	19.32	25.70	25.72	32.00	32.25
Lower hitch attachments						
Diameter of lower hitch attachment hole (D_2)	22.40	22.73	28.70	29.03	37.40	37.75
Lower hitch attachments span (S)	683.± 1. 5		825±1.5		965±1.5	
Mast height						
Mast height (H)	460 ± 1.5		610 ± 1.5		685 ± 1.5	

Table 2 (a): Upper link point pin dimensions

Dimension	Cat 1	Cat 2	Cat 3
Diameter of upper link point pin (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 pin 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

4.2 **Auger Drive System (Figure 3)**

4.2.1 Auger drive system shall consist of a coupler bush with pin, gearbox, female coupler end and UJ drive shaft.

4.2.2 Coupler bush shall be made from MS having outside dia. mm and inner dia. to accommodate pin made from MS round of 28 mm diameter.

4.2.3 Gearbox shall be made from SG iron and shall contain a set of bevel gears with speed ratio of 1:3. The gears shall be mounted with 02 Nos. sealed 7613 bearings on the upper side and 01 No. sealed bearing 6309 on the lower side. The PTO side of the gearbox shall have 02 bearings of 7510 and 7511. The gearbox shall have a standard UJ drive shaft with female end.

4.2.4 Female coupler end shall be made from MS having outside dia. 90 mm and wall thickness 9 mm. It shall be made integral part of gearbox at the lower end. Female coupler end shall be 150 mm long.

4.3 **Auger Assembly (Figure 4)**

4.3.1 The auger assembly shall consist of male coupler end, auger shaft, auger screw and cutting edge.

4.3.2 Male coupler end shall be in the form of a bush made from MS having outside dia. ---(100) mm, wall thickness ---(80) mm and ---(125) mm long.

4.3.3 Auger shaft shall be made of MS pipe having outside dia. 72 mm, wall thickness 9 mm. It shall be 800 mm long.

4.3.4 Auger screw shall be made from MS sheet 6 mm thick.

4.3.5 Cutting edge shall be made from 12 mm thick hardened steel, heat treated and shall be replaceable. The hardness of cutting edge shall be HRC 45.

5 OTHER REQUIREMENTS

5.1 All the structural components shall be manufactured by using new materials.

5.2 All the market items like tines, shovels, sweeps, 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 post hole 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 All the nut bolt fastenings shall be tightened at appropriate torque using imported spring washers.

5.7 Operation and maintenance (O&M) manual shall be provided in English & Urdu with complete illustrations of assembling of replaceable components.

5.8 O&M manual shall also contain relevant safety instructions as provided in PS 877:1972 and ASAE S318.9/SAE J208d.

5.9 A set of pins with linchpins and two adjustable wrenches of 250 mm and 300 mm size should also be provided.

5.10 The implement shall be painted preferably using baking/stoving paint with primer.

5.11 The frame shall be rigid and strong. The frame members shall be welded perfectly at right angle.

6 FINISH AND WORKMANSHIP

6.1 All components of the posthole 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 smoothened 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 post hole 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 post hole digger.

7.3 Each posthole digger may also carry the PSQCA Certification Mark subject to verification by the competent authority.

7.4 The posthole 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 Post Hole Digger is shown in Figure 5. The design can be modified as agreed between the purchaser and the manufacturer subject to compliance of these standard specifications.*

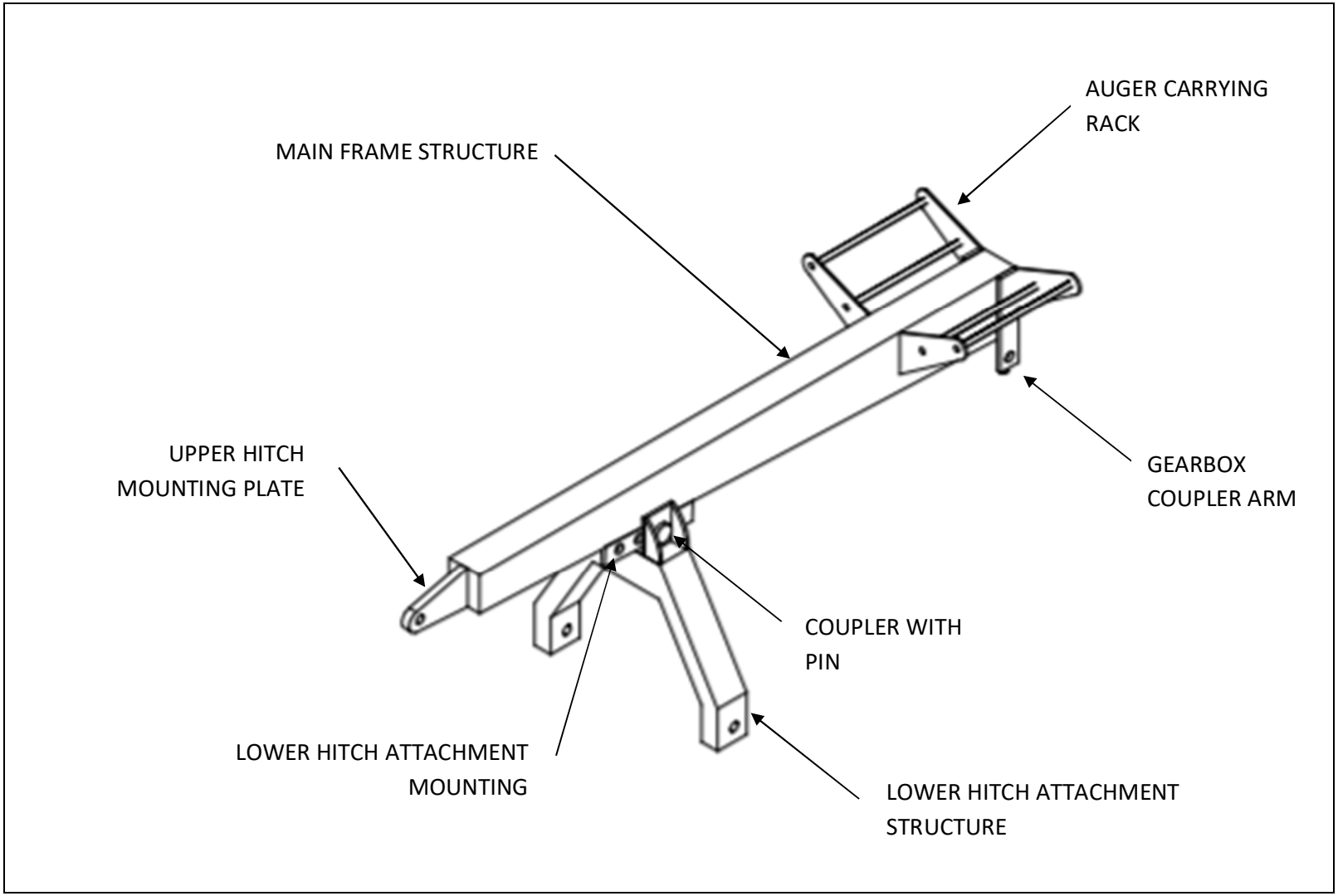

Figure 1(a): Frame and three point hitch assembly

Figure 1(b): Three point hitch dimensions

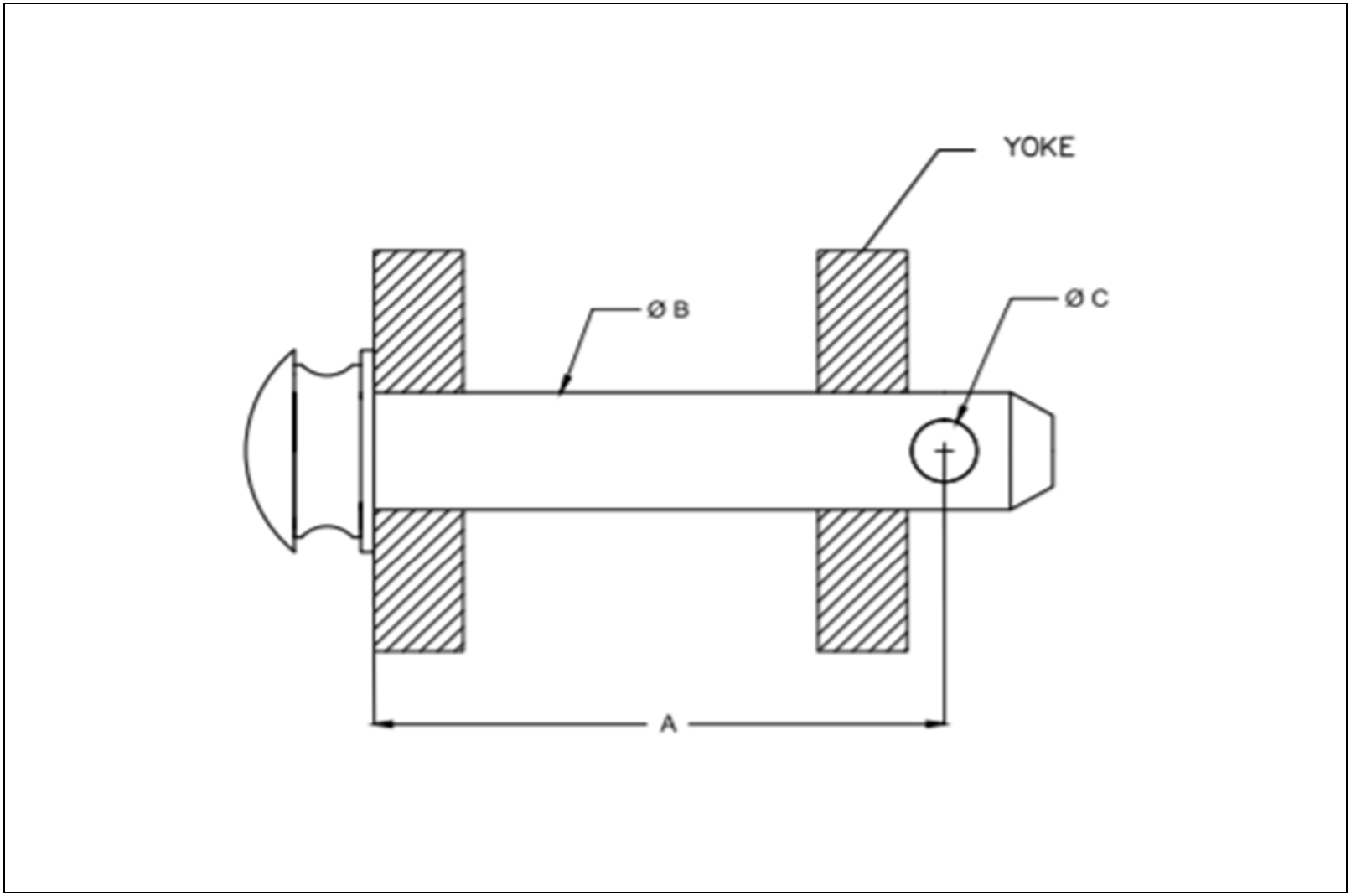

Figure 2(a): Upper hitch attachment pin dimensions

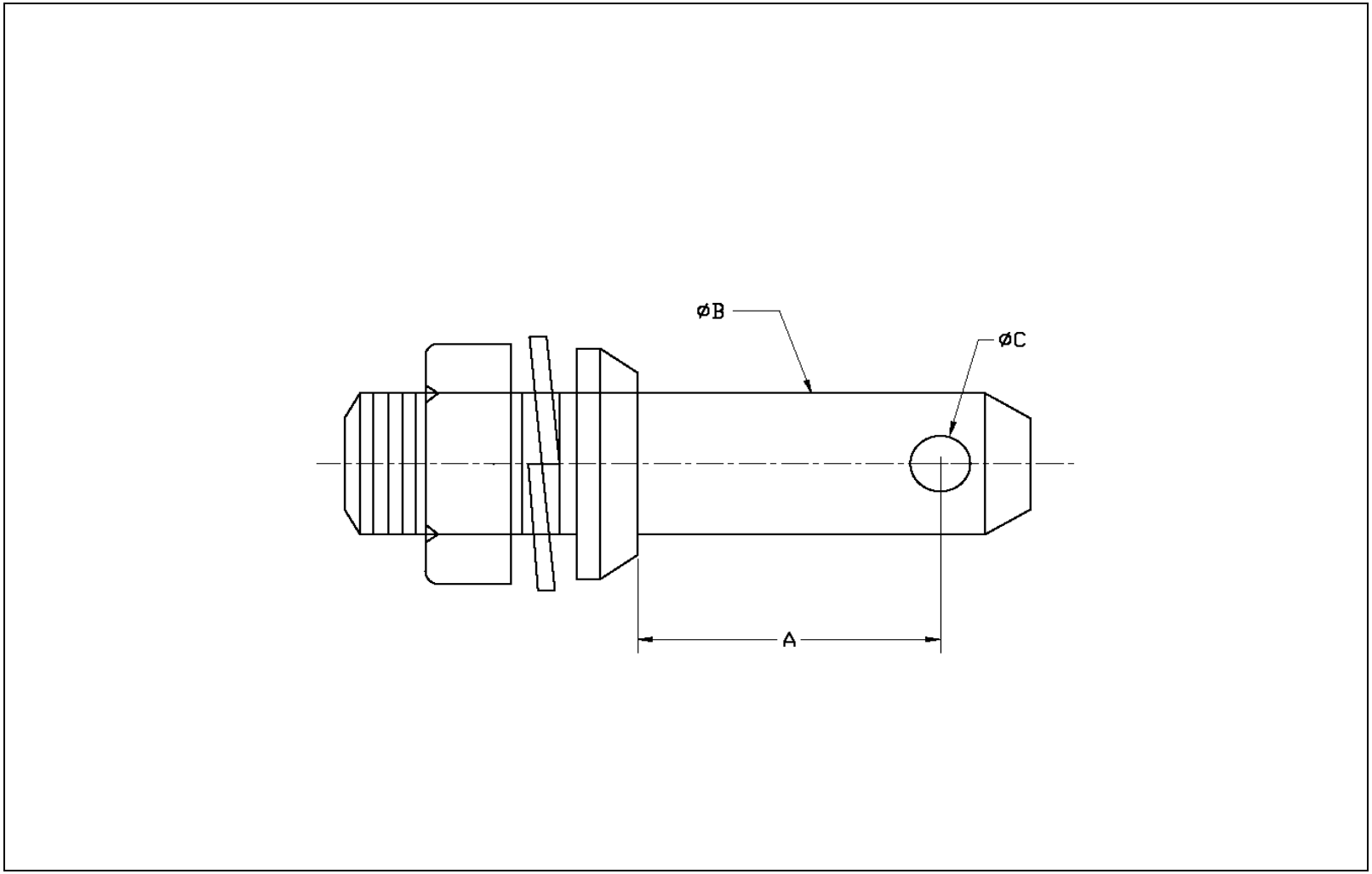

Figure 2(b): Lower hitch pin dimensions

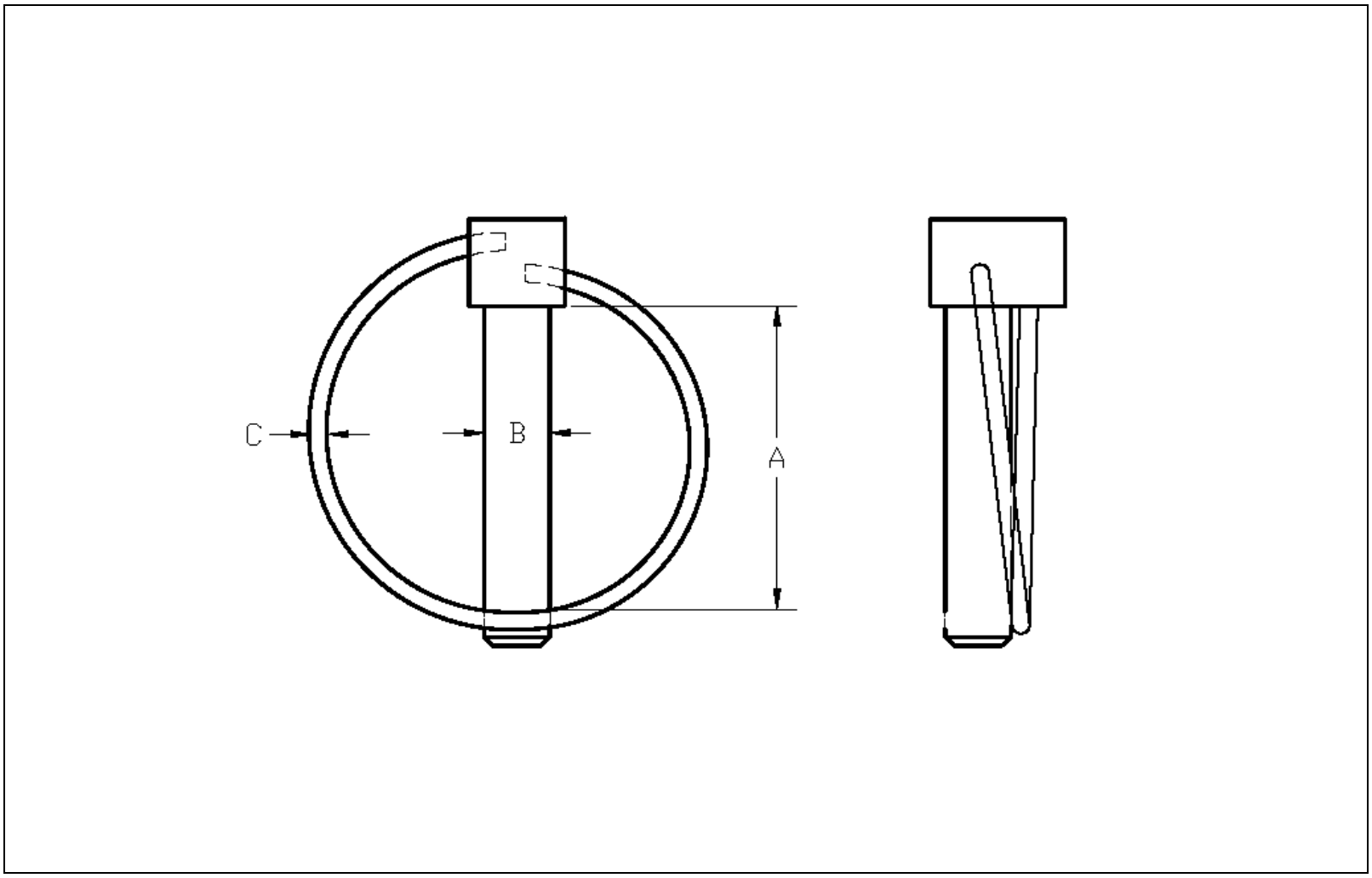

Figure 2 (c): Lynchpin dimensions

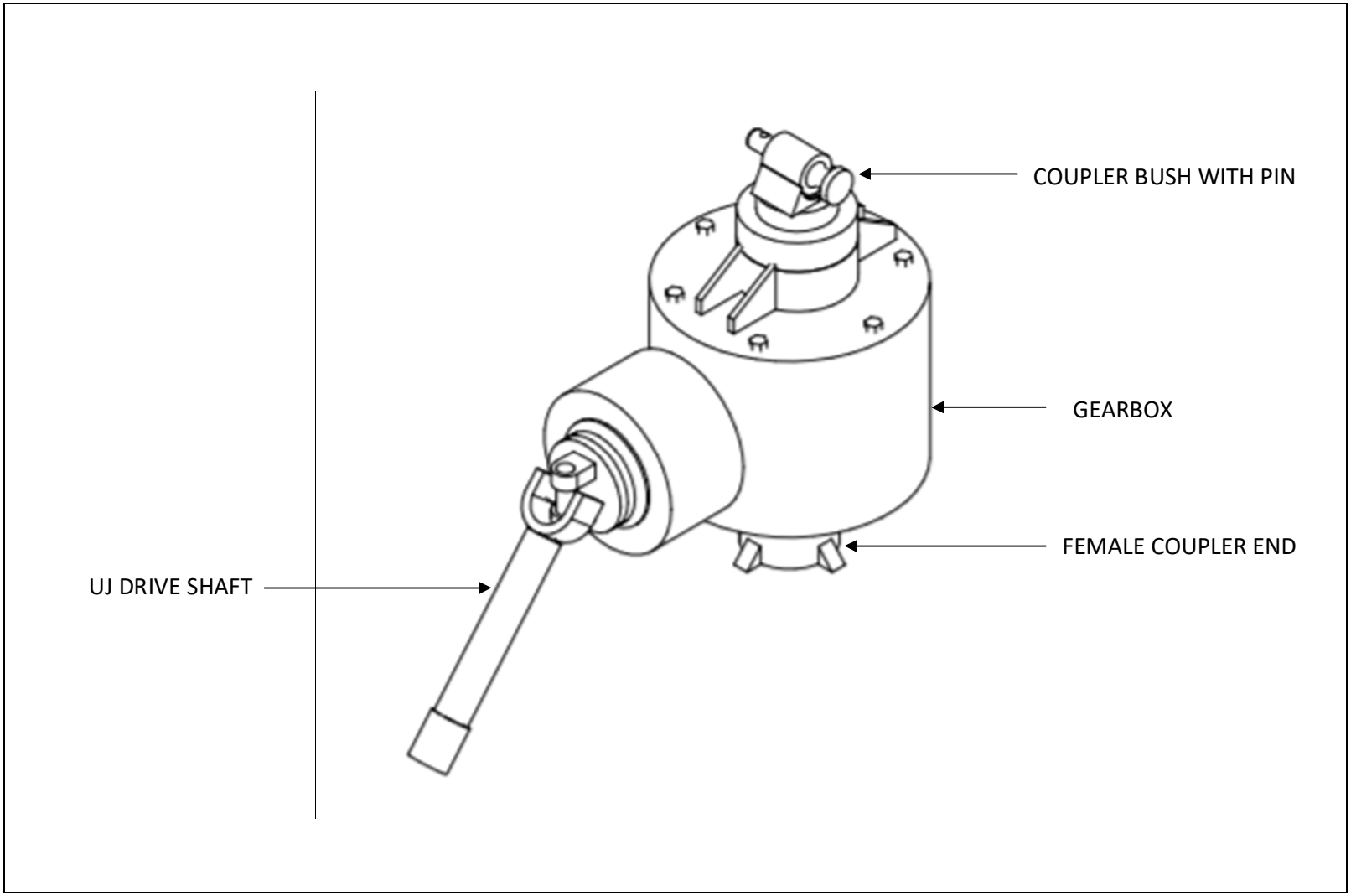

Figure 3: Auger drive system

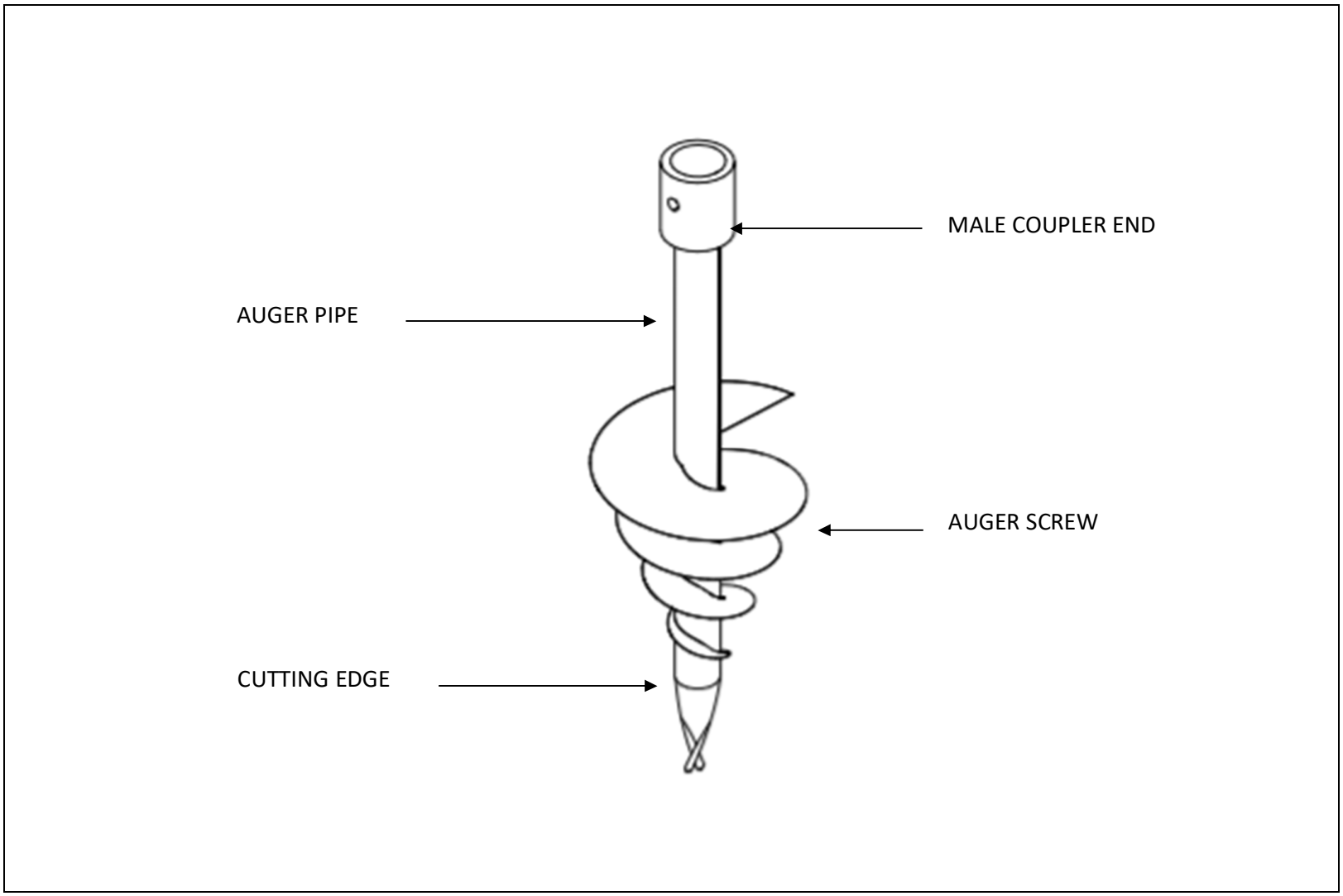

Figure 4: Auger assembly

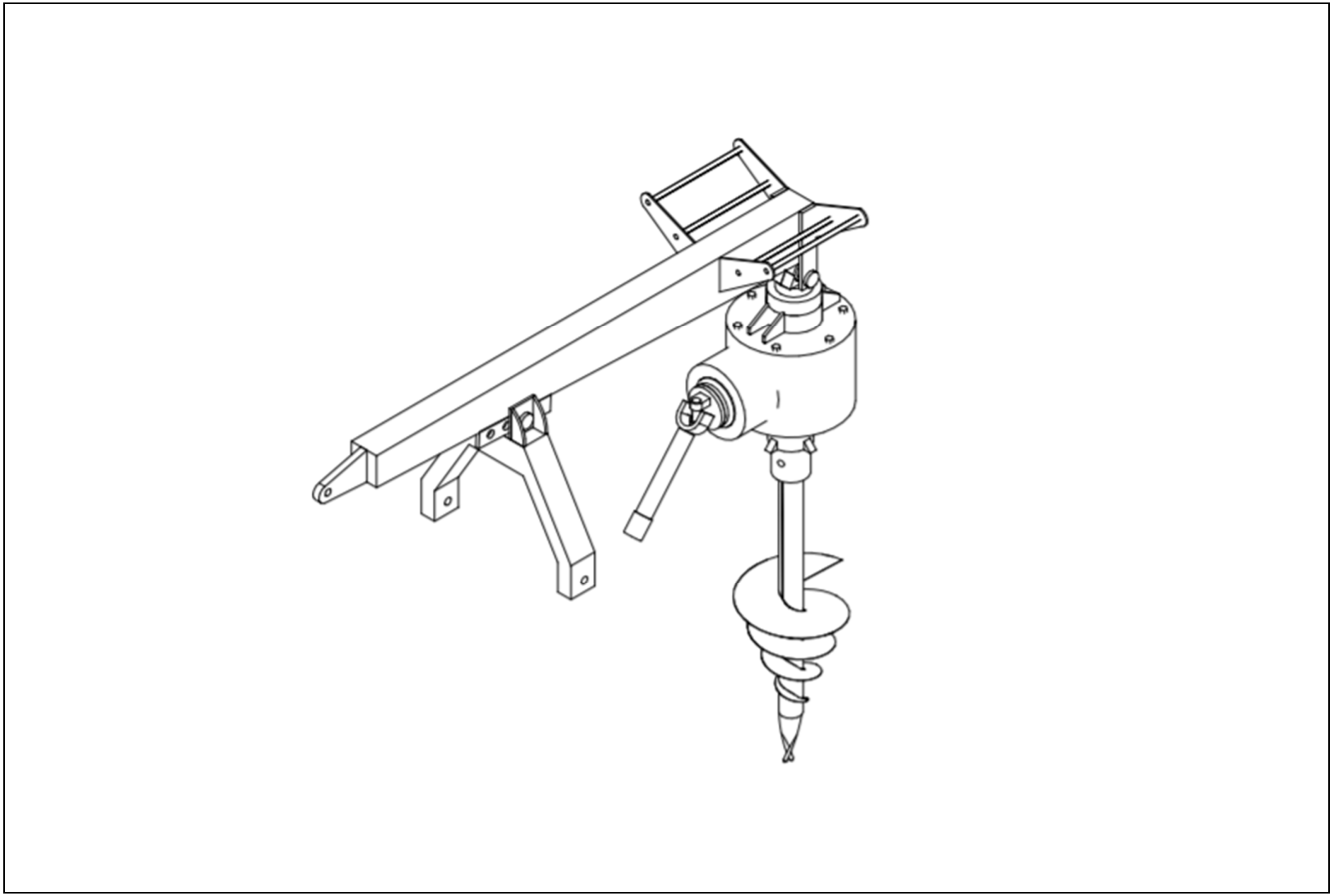

Figure 5: Typical post hole digger