



TIANCHENG ELECTRICAL MARINE EQUIPMENT PTE LTD

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GST / Registration No: 201114137Z



SNG6017996

1. SCOPE

Subsea pipeline is fast becoming a vital part of offshore oil and gas development engineering facilities. During the piping installation and operation, the wave flow resulting from the sea turbulence and natural environmental load will affect the stability of the pipeline. With the intention of stabilizing the underwater pipeline, The **Screw Pile System (SPS)** was invented in an effective way to secure the oil and gas pipe onto the seabed. It ensures the pipes to immune to the external environmental elements such as sea currents and/or uneven seabed.

2. ABSTRACT

In today's technology, technical enhancement has been a practice for all. Likewise, we have designed our **Screw Pile System (SPS)** in ways to suit and expedite the process of work to ease the time consuming and the portability of the device.

The traditional piling system, which is by hammering a pile into the sea bed will require about 2½ days to pile one pile to stable the pipe. As for our device, **Screw Pipe System (SPS)**, we are using drilling system that requires only about 20 minutes drill per pile to secure it. This greatly saved up enormous amount of hours of work for the company. We also used a high tech control system to stabilize the vessel in the sea and not affect the anchor pipe system during drilling. The beauty of this device is that it has an extremely long lifespan and easy maintenance too.

The key technology involved, is a hydraulic motor drive screw anchor body rotation, through the thread of engages with spiral guide sleeve screw anchor axial movement in rotation simultaneously, making its screwing in formation. The submarine pipeline is fixed at the bottom of the sea with deep sea positioning technology.

This device includes the execution part of mechanical system, hydraulic system, control and electrical operating system. Each system is fixed into a single panel using low speed high torque hydraulic motor for guarantee power output to accomplish work. These systems can be separated into individual groups to deliver to client's site, making it convenient and easy for transportation and installation.



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3. DETAILED DESCRIPTION AND DRAWINGS

Our Screw Pile System is a device that has a simple outlook, yet, consisted of a precise positioning technology that are able to go as deep as 30m underwater of the sea. The device is maneuver by an electrical control console panel and hoist from a platform to the area of work. And it used a monitor, to enable easy excess to the designated work location, as well as, to determine the exact positioning of the pile. During the drilling process, the seabed surface will be full of the silt and loose geological soil. With our device, the divers will not need to face such mess.

Technical Parameters

Technical parameters of our equipment are as follows:

Total weight of the equipment	:	6000Kg
The weight of the structure	:	2000Kg
Payload weight	:	4000kg
Type	:	DNV type E
Operational Class	:	R45
Design Temperature	:	-20°C
Maximum Torque	:	14,000 Nm
Output Torque	:	2 x 30 kW
Fixable pipeline diameter	:	6 – 36 inches
Rotational anchor pipe diameter	:	2 – 6 inches
Rated speed	:	0 – 16 rpm
Hydraulic system pressure	:	280 bar
Maximum working depth	:	30 meters
Shaft Length	:	18 meters



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Shaft max. strength : 28,000 Nm

3A. Mechanical System

i) General Description

A mechanical system manages power to accomplish a task that involves forces and movement. Screw Piles framework, hydraulic motor and the drive shaft constitutes Mechanical System. The top part of the anchor pipe and the hydraulic motor output shaft are connected together via screw sockets. The middle part of screw pile has a helical blade, and the drill is equipped at the bottom. The mechanism of a mechanical system is assembled from components called machine elements. It provides structure for the system and controls its movement. The structure components are generally, the frame members, bearing, splines, springs, seals, fasteners and covers.

3B. Hydraulic System

i) General Description

The basic principle behind any hydraulic system is the force that is applied at one point and transmitted to another point using an incompressible fluid. The force is almost always multiplied in the process.

Hydraulic system includes i) hydraulic power pack, ii) pressure regulating system, iii) directional control system and actuator system. The pressure regulating system includes the logical cartridge manifold, poppet solenoid valve, relief valve, counter balance valve. The maximum system pressure can be up to 250 bar.

The directional control system mainly comprised of a 3 way, 4 position directional control valve. The flow can reach up to 150L/M. The actuator system includes two Hagglunds CA70 hydraulic motors. And the motors are submersible into the sea water during operation. Two special blocks adhere to the motors to control the submersible oil flow to work efficiently.

The great thing about hydraulic system is that the pipe connecting the local control stand to the manifold block that is attached to the frame, can be any length



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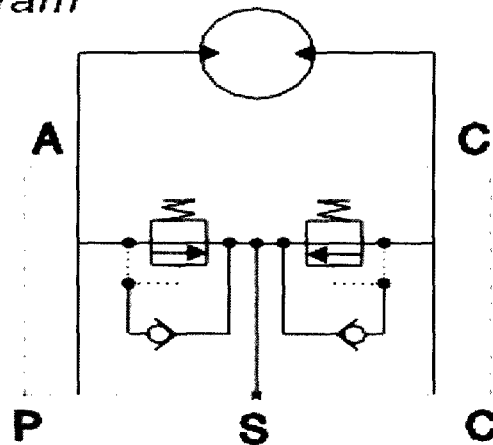
and shape, allowing it to snake through all sorts of things. The neat thing is that it is easy to add force multiplication to the system.

The hydraulic motor drive the rotation shaft directly .The transmission shaft key is fit for hydraulic motor. The bottom and the threaded guide sleeve also have the key connection together. The method helps to ensure that the normal drilling vibration will not damage the equipment and will play the role of the buffer reducer at the same time.

In diesel hydraulic power pack systems, they are connected through engine, coupled to pump to supply high-pressure oil flow to the system, which has a big effect on the efficiency of the system.

a) Schematic diagram

Schematic diagram



The Counter Balance Valve protects the motor from overload.

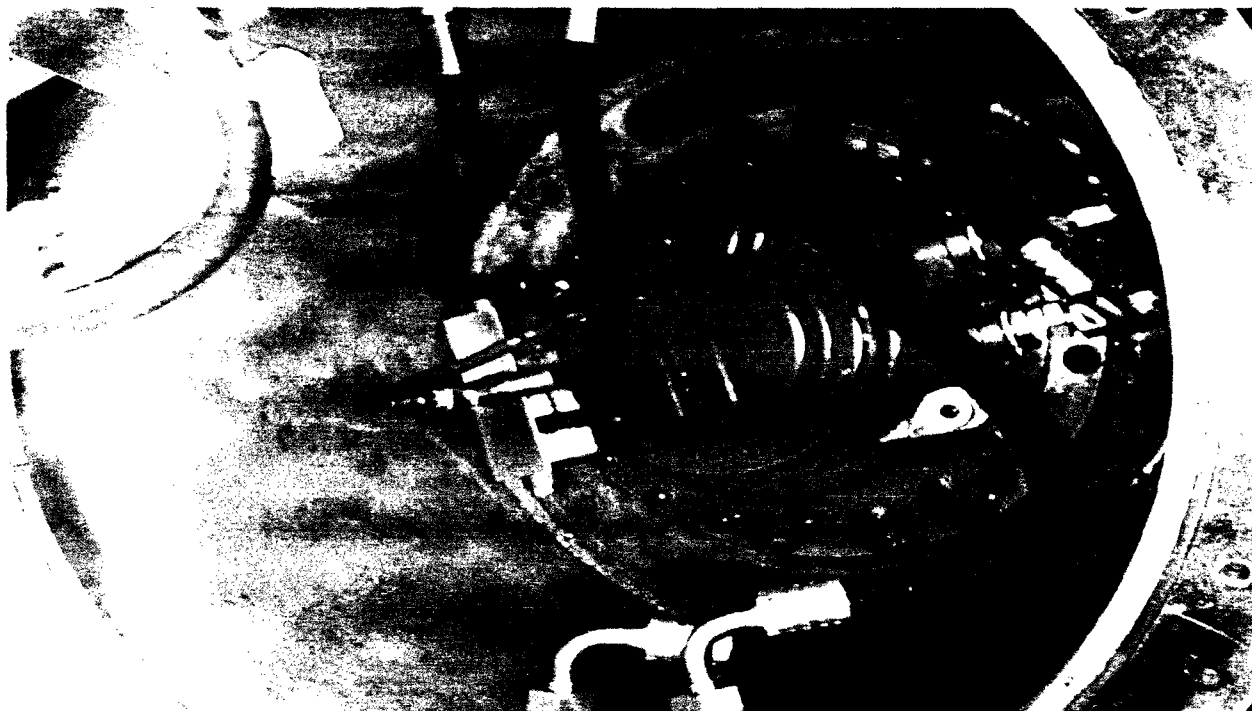


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D) Start up and Operating Procedure of Screw Pile System

1. Check hydraulic hose connections between screw pile systems, local control stand and diesel engine power pack. (see below schematic drawing)
2. Start diesel engine power pack.
3. Check hydraulic pressure at power pack and local control stand. Waiting for pressure to build up to 20 bar.
4. Start drilling operation by holding joystick up and down.
5. Hold the joystick up for operating Screw Pile System In forward direction.
6. Hold the joystick down for operating Screw Pile System in reverse direction.
7. Monitor hydraulic pressure at local control stand and it is recommended to operate not more than 210 bar.

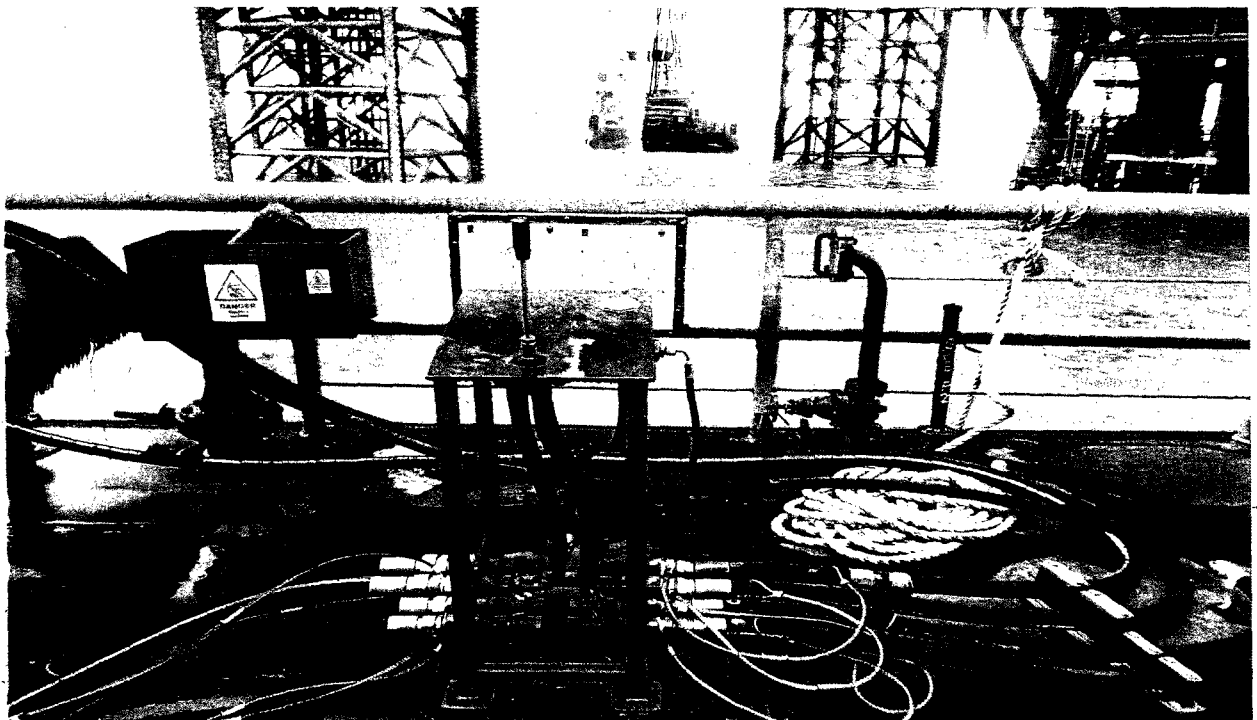
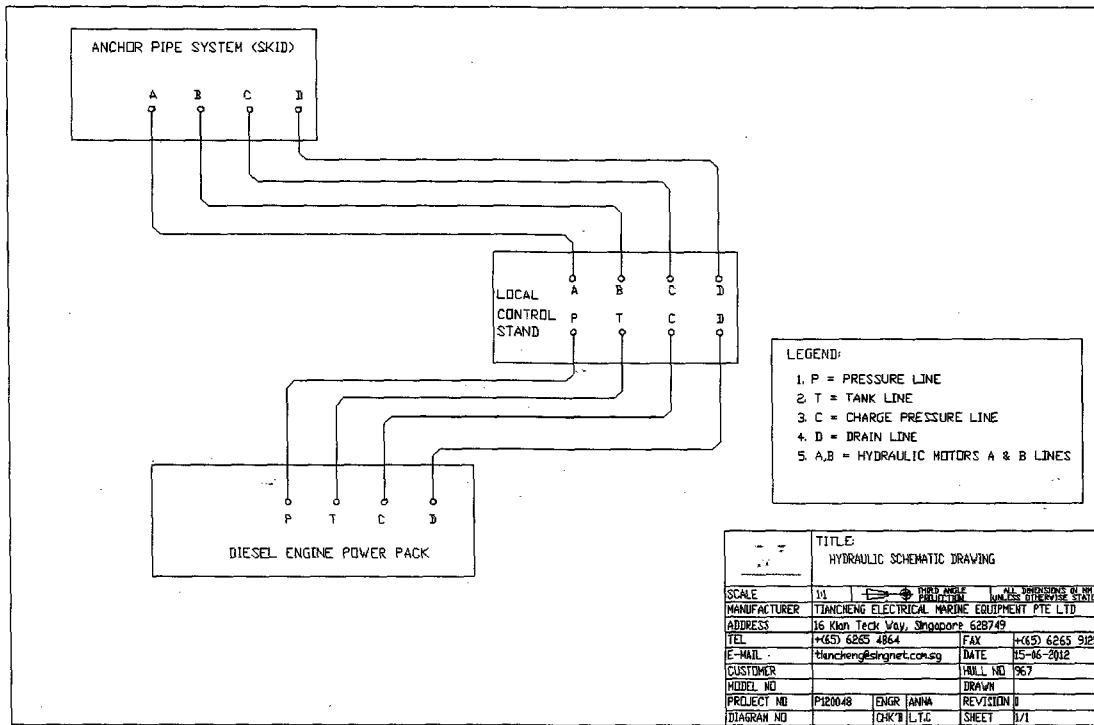


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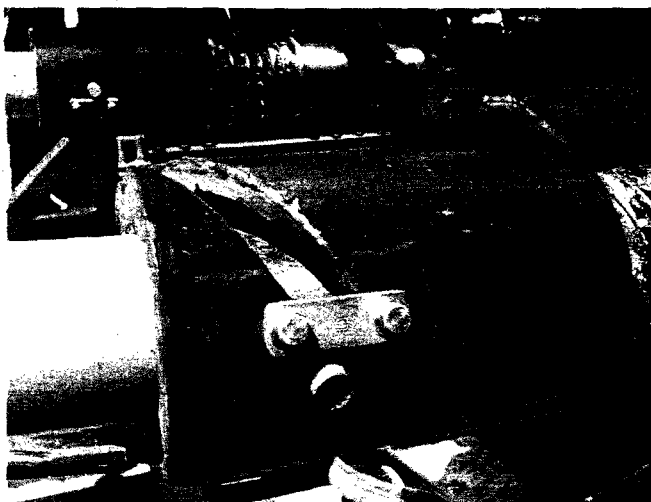
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1. CLAIMS

We claim the following listed items stated

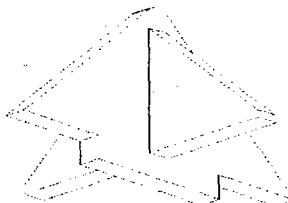
4.I.i) Cam Bush 1 & 2

The cam bush function is to hold Screw Pipe to rotate clockwise for drilling. Once it has installed the pipe, they will move anti-clockwise along the inner thread line to complete a process to detach away.



4.I.ii) Drill

The drills are attached to the 2 pcs of pipes of the Screw Piles Systems for drilling purpose.





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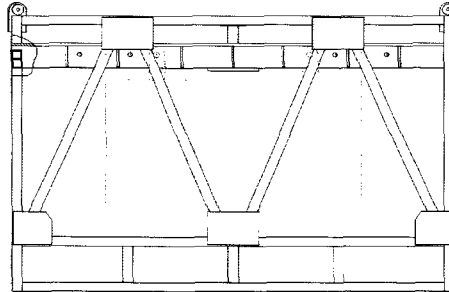
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4.I.iii) Frame

The framework of equipment has gone through DNV Rule 2.7.3 DNV certification processed and obtained the authentication certificate, which is designed to meet the requirement of the system working load.



Material Used	:	Steel
Measurement	:	2480mm (H) x 1880mm (W) x 3460mm (L)
Shape	:	Rectangular
Total Weight	:	2012 kg

4.I.iv) Motor Box – Hydraulic Motor

The hydraulic system includes hydraulic power pack, pressure regulating system, directional control system and actuator system. Two special locks adhere to the motors to control the oil flow to work efficiently. The low speed high torque hydraulic motor can guarantee enough power output and be able to complete the task smoothly. Motor housing is sealed to ensure that there won't be any leakage and rusting. The peripherals for the motor housing are anti-corrosion resistance.



Motor Brand	:	Hagglunds
Material Used	:	EH 36
Max. Torque-on-Bit	:	2 x 25000 Nm



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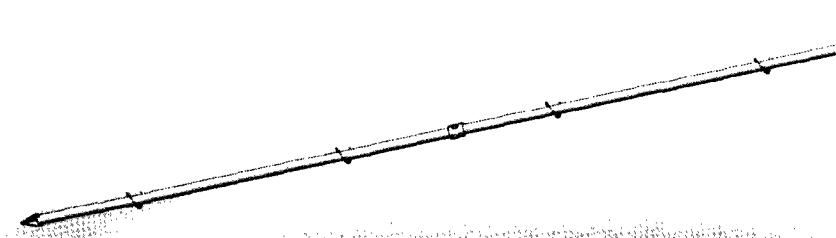


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Output Torque	:	2 x 55 kW
Unit Weight	:	824 kg
Max. System Pressure	:	250 Bar

4.I.v) Pipe

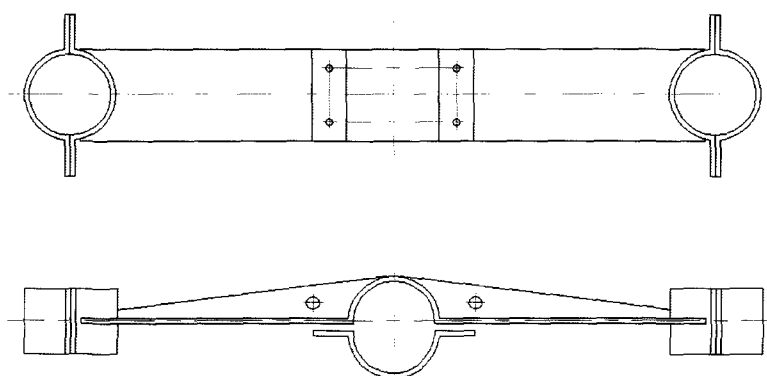
These are 2 length of long bar of steel being used for the screwing



Material Used	:	Steel
Length	:	18m

4.I.vi) Pipe Clamp

The pipe clamp act as a holding device to prevent the oil pipe from movement in the cause of undersea current.





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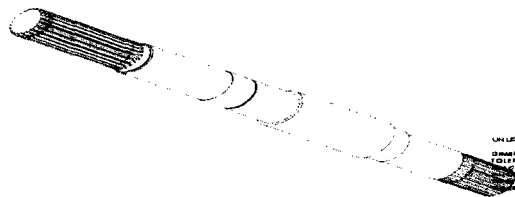
4.I.vii) Screw Socket

A screw socket is a type of fastener that is used with a hexagonal wrench. This fastener is used in a myriad of applications where a strong bolt or screw is called for. Requiring, less room than the common hexagonal bolt and nut.



4.I.viii) Shaft

The hydraulic motor drives the rotation shaft directly. Between the spiral and the shaft is the spring connection. The shaft head has a slotted outside and use the elastic O ring to fix. The method helps to ensure the normal working vibration and will not damage the equipment by playing the role of the buffer reducer at the same time.



Material Used	:	AISI 1045
Measurement	:	OD 6" – OD 12"
Length	:	18 m
Shape	:	Spline Shaft
Max Strength	:	20,000 Nm
Speed	:	0 – 18 R/min
Unit Weight	:	352 kg
Total Weight	:	704 kg



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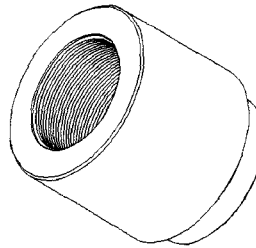
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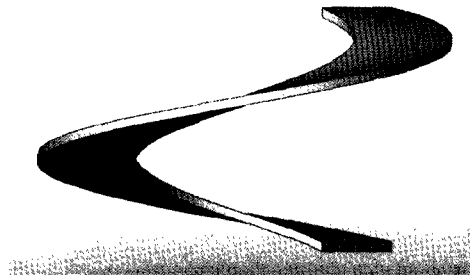
4.I.ix) Threaded Bush (Bolt & Nut)

A Threaded Bush is a fastener element that is inserted between screw pipes of 6m each into a threaded hole. They may be used to repair a stripped threaded hole, provide a durable threaded hole in a soft material, place a thread on a material too thin to accept it, mold or cast threads into a work piece thereby eliminating a machining unified to metric threads or vice versa.



4.I.x) Vane

The vane is a thin flat and curve device attached to the shaft as a spire that is rotated about an axis by rotating to cause or redirects a flow.



Material used	:	Steel
Thickness	:	10mm
Width	:	OD 300
Length	:	ID 6"



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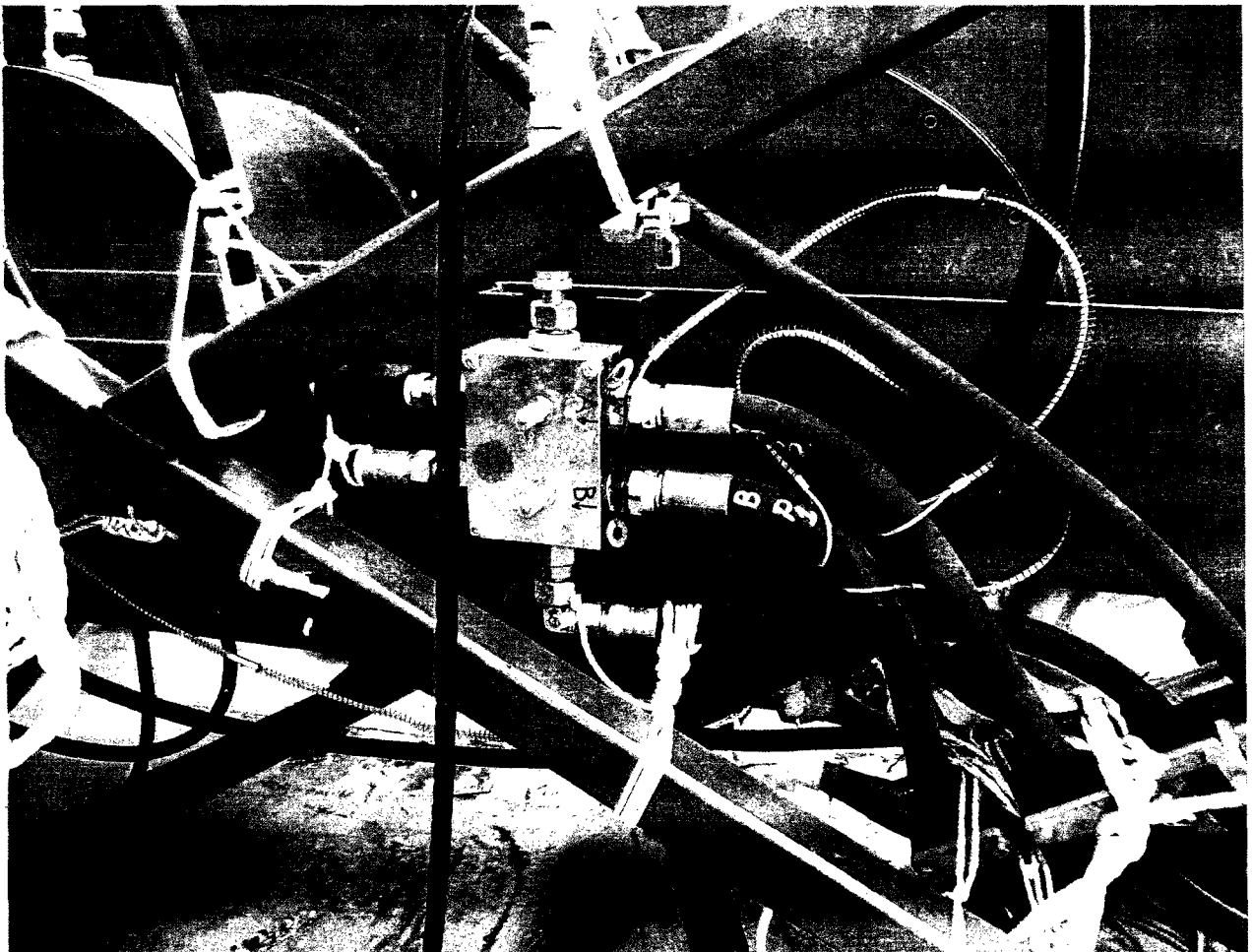
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4II) Hydraulic System

We also claim the following apparatus that have unique features in our Screw Piles System.



The Manifold Block was attached to the underside of the base of the frame where it is Like the heart of the Hydraulic System. It is also alike to a neuron in controlling the oil flow, the oil pressure and also had a function of balancing the Screw Pile System while the system is at work, and it is also link to the *Hydraulic System* where the power is synchronized and adjusted automatically when the condition of the soil is either hard or soft under the sea bed.

