New System: MAKEBLOCK This system, from China, is in the same style as VEX (see 34/1006, 41/1243 & 1253). That's to say a range of parts including motors and electronic components to make Robots and almost any other electro-mechanical device. Some kits are available for specific models but, as with VEX, there are no 'cladding' parts to give the models greater realism.

MAKEBLOCK is made by the Hulu Robot Technology Inc. of 426 Gong Le Hua Ting, Xinhu Road, Xixiang Jiedao, Baoan District, Shenzhen, China. Shenzehn is a large city some 40km north of Hong Kong. Development started in 2011 & the company now has 10 employees. There are agents in 10 countries including for the UK, The Little British Robot Company of Wollaston, www.thelittlebritishrobotcompany.co.uk. What follows is taken from the Makeblock website: www.makeblock.cc.

The PARTS

I counted 92 in all. Most non-electrical parts are aluminium, anodised blue or yellow, your choice. The few steel parts are mostly zinc plated. The hole pitch is 8 & 16mm and the thread M4 (though Grub Screws are M3). Holes in some parts are 4.1 or 4.2mm but sometimes the size isn't given and it is said that they can be drilled out for '4mm hardware' – Shafts no doubt but possibly threaded items too. Bosses are usually double-tapped M3 at right angles.

Structural Parts

Beams. These are the main structural parts and there are two types. The 5 **Beams 0808** (Fig.1) are from 80 to 192mm long with 5 to 12 holes at 16mm pitch, and have an internal thread along the inside walls. The latter allows Beams and other parts to be added anywhere along their length. I think the double circle showing the side holes in Fig.1 denotes a chamfer – they are the 'to be drilled out' size. **Beams 0824** (Fig.2) are in 9 lengths from 64 to 192mm. They have tapped holes in each end to further add to their ease of use and nearly all of the structures of the models shown on the website are made from these Beams.

Brackets, Plates, etc. **Perforated Plate** 3*6h. **Disc** (Fig.5, with Beams bolted to it). 2mm thick and about 60mm o.d. **Link Rod** ('a' in Fig.3), 2mm thick, 20h long, with holes at 8mm pitch. It is to be cut to length and can be used for light frameworks, to reinforce end to end joints in Beams, etc, etc. 11 **Brackets** are listed, with 6 of them to allow specific items such as Motors to be mounted, and 5 for general use. 3 of the latter are shown in Fig.3, all to about the same scale, and all with holes at 8mm pitch. The **Bracket 3x6** 'b' has a smaller **3x3** version, 3*3*3h. The **Bracket P1** ('c') is 33mm long and its end hole is tapped. Of the 3 overlapping side holes the centre one is 4mm Ø and the outer ones 3.7mm. The top hole of the **Bracket P3** ('d') is 8mm Ø, the centre end hole 6mm. The **General Bracket** (Fig.4) is 24mm long with a bore of 28.4mm Ø: circular section components, a marker pen and a Motor are shown as examples, are clamped down onto the bore's bottom vee by long Bolts through the top tapped holes.

Hardware. **Socket Cap Screws**: 8, 14, 22mm u/h. **Nut**, hexagonal, 3.2mm thick, probably steel. **Stiff Nut**, hexagonal. **Socket Grub Screw**, M3. **Plastic Rivets**. Button headed rivet pushes into a lipped sheath – the sheath itself in 2 sizes: 4mm o.d. (4, 6, 12mm long), & 3mm o.d. (7.5mm long).

Shafts, Slides, Pulleys, etc

D Shafts, 50 & 160mm long, are 4mm Ø with 0.4mm removed to form the flat. This to give Grub Screws a better grip. **Shafts** (called Linear Motion Shafts): **4mm Ø**, stainless steel, 288mm long; **8mm Ø**, chromed steel, 480mm long, with ends counterbored 12mm deep & tapped M4. **Shaft Connector** (Fig.6). Used in pairs. The disc is 22mm Ø & 5mm thick with 4 face holes on a 16mm pcd, 2 of them tapped M4. The edge tapping is for a Grub Screw. **Flange Bearing**. A 4mm ball race, 8mm o.d. with a 9.2mm Ø flange. Fits into the Bracket P3. **Linear Motion Slide Unit** (Fig.7). The side holes are tapped M4 through to the base. A pair mounted on an 0824 Beam are shown sliding along parallel 8mm Ø Shafts. The bearing is said to be 4 rows of recirculating balls. **V-slot Bearing**. A 13mm Ø loose pulley. **Slider** (Fig.8). A 256 or 496mm long extrusion with a lengthways internal thread. It runs between a pair of V-slot Bearings mounted at 16mm centres, or a slide can run along a pair as in Fig.9. **Screwed Rods**, M4, steel, 192 & 280mm long. **Thread Drive Beam**. A 5h long 0808 Beam with its centre holes tapped through M4.

Timing Pulleys etc. All 4 parts are aluminium and 3 are shown in Fig.10, though not to scale. The smallest (a) has 18 teeth and a 4mm bore. The largest (b) has 90 teeth and is 58.2mm o.d. with an 8mm bore. A 62 tooth version is similar to the 90t but has shorter arms with only 2 holes. Both these are extrusions, 8mm thick, and are held to a 4mm Shaft by bolting to a Shaft Connector. Also shown is one with a Flange Bearing inserted into each end of the bore. Part (c) is called a Pulley Slice: it is .8mm thick, 62mm o.d., and has no teeth. A pair can be attached to the sides of the 90t Pulley as flanges using Plastic Rivets. **Timing Belts**. Neoprene, 6.6mm wide, 2.032mm pitch. 2 & 5m long unjoined, and joined with 123, 216, 378 teeth. **Tyre** (Fig.13). Black silicon with 'Makeblock 68.5x22' moulded onto sidewall. Fits over Timing Pulley 90T. **Track Elements** (Fig.14) are of black silicon held together with metal Pins. Tracks run on the Timing Pulleys.

Fittings

Threaded Shaft (Fig.11). Used as per Meccano's Threaded Pin. **Collar**. 10mm Ø with 4mm bore and 5mm wide. **Studs** (Fig.12): (a) Threaded M4, 16 & 32mm long; (b) M4, 14mm long o/a with 6mm long threaded spigot, & 7mm of internal thread. Both are brass, about 7mm A/F. **Universal Joint** (Fig.15). Stainless steel with a 4mm bore, and 22mm long o/a. **Flexible Coupling** (Fig.16). Aluminium, 16mm Ø x 23mm long, for 4mm Shafts. The helical groove is said to give flexibility. Tapped 4x M3 for Grub Screws.

Other Parts

Battery Holder for 6x AA cells. **Robot Gripper** (Fig.17) with 70mm jaw opening, and operated by a solenoid. **Strong Robot Gripper** (Fig.19). Mainly made of acrylic with 76mm maximum opening. Driven by the motor's screwed shaft. 2 or 4 jaw configuration possible. **Robot Turntable** (Fig.18). The main part is a big aluminium bearing supported by brass pillars from an acrylic circular base board, with the intermediary board to carry a driving Motor. The design is subject to change. **Castor** with a white plastic wheel. It can be bolted through the 8mm hole in Bracket P3.

Motors etc

All Motor shafts are 4mm Ø. **DC-25 & DC-37**. 6/12v, geared to 185/50rpm, with 25/37mm Ø bodies, 52/56mm long. **Stepper 42BYG**. 12v, 1.8° steps. 42mm cube body. **Servo MED 515**. 6v. Body 47*52mm o/a x 20mm wide. The output shaft is from one of the 20mm wide sides and carries a 24mm Ø face plate. **DC Frame Type Solenoid HCNE1-0530**. 12v, 6mm stroke of 6mm Ø shaft.

Electronic Modules

There are 12 of these and, as their finer points are beyond me, some of the key words are: drivers for Motors (including LEGO), Servos; Ultrasonic & Limit Switch sensors; Line Finder; Infrared Decoder (remote control is by IR); and Bluetooth (to link to mobile phones for instance). Also mentioned are Arduino & Meduino with talk of easy programming and open source software. Meduino is the name used for MAKEBLOCK modules and they are said to be Arduino compatible. Wikipedia says that 'Arduino is a single-board microcontroller to make using electronics in multidisciplinary projects more accessible. The hardware consists of an open-source hardware board designed around an 8-bit Atmel AVR_microcontroller, or a 32-bit Atmel ARM. The software consists of a standard programming language compiler and a boot loader that executes on the

microcontroller. Arduino boards can be purchased pre-assembled or as do-it-yourself kits. Hardware design information is available for those who would like to assemble an Arduino by hand. It was estimated in mid-2011 that over 300,000 official Arduinos had been commercially produced.'

KITS

Mechanical Kits. The 7 of these include various Robot chassis, a Music Robot including a Xylophone, and an X-Y Plotter. All the Kits contain appreciably more parts than are needed for the featured model.

Electronic Kits. A Starter outfit with the electronics to allow IR control and a line finder Robot. An Advanced kit which contains most of the Electronic Modules.

Extension Kits. There are 7 of these: 2 for a Motor, 4 with Beam parts, and Servo, Motion, & Thread Drive Packs.

MODELS

Step-by-step instructions for 10 models from the Arduino library can be downloaded from the website. All are structurally quite simple and no details are given of the electronics needed to control them. 6 of the models are tracked Chassis with 2 of them carrying a Gripper which can move fore & aft. One is a Beer Robot (a 3-wheeled chassis carrying a bottle which can tilt, and one a Slide Drive mechanism. The other two (slightly more interesting ones) are shown overleaf.

REMARKS

MAKEBLOCK doesn't have as large a range of parts as VEX, and noticeably lacks Gears, or any straightforward way of providing a right-angled drive.

It does though have some interesting and innovative

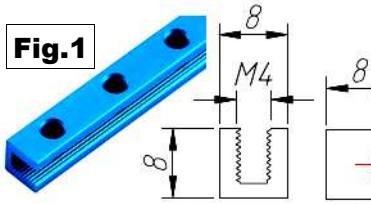


Fig.1

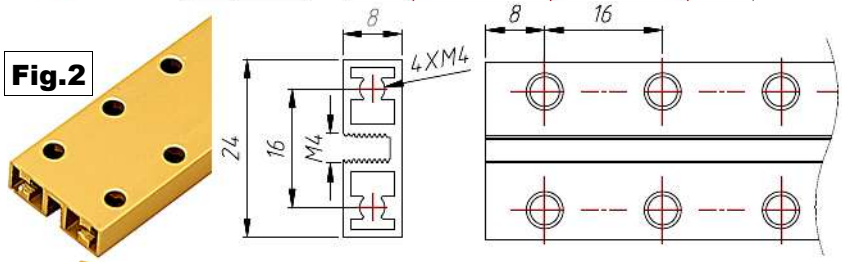


Fig.2

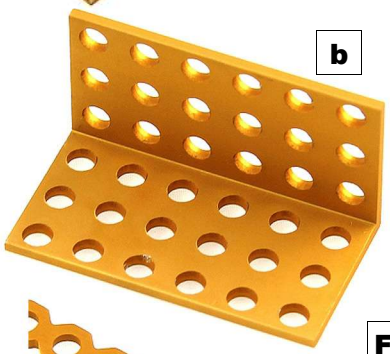

b

Fig.3

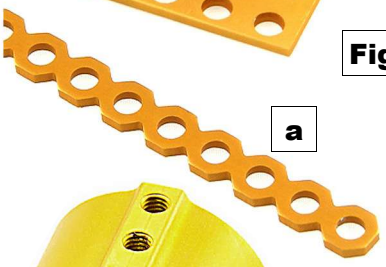

a


Fig.4

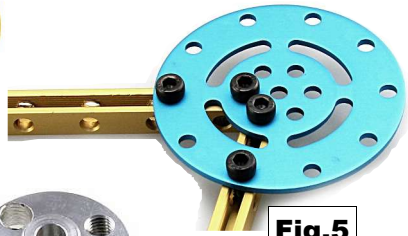


Fig.5


Fig.6


Fig.7

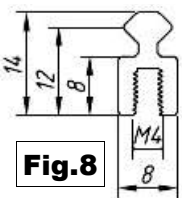


Fig.8

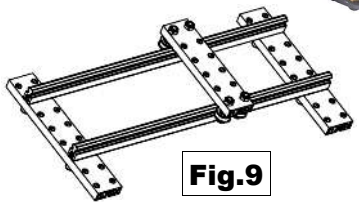


Fig.9

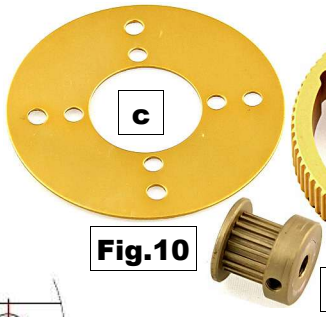
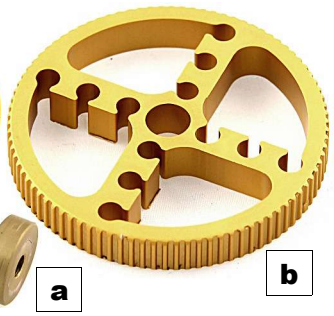

c

Fig.10


b

a

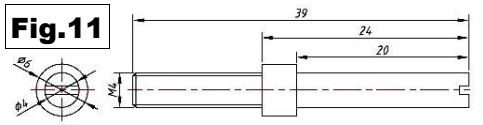
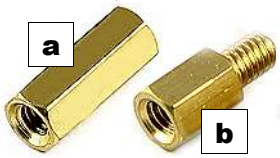


Fig.11


a

b

Fig.12


Fig.13

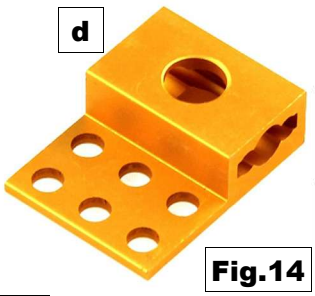

d

Fig.14

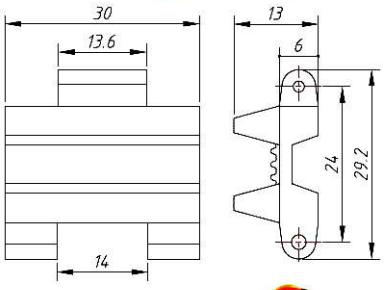



Fig.15

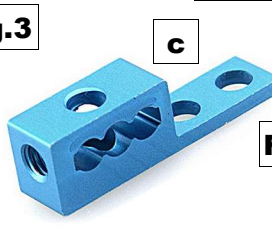

c

Fig.16

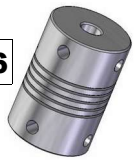


Fig.18

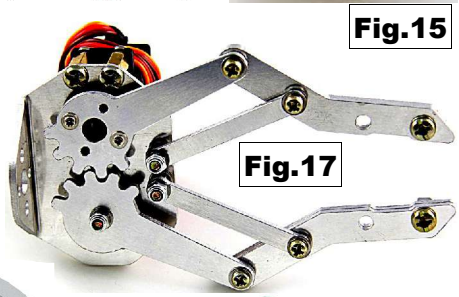


Fig.17

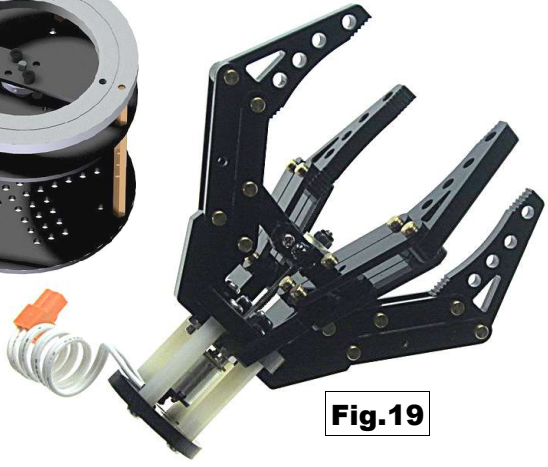


Fig.19

parts,including some, such as the Linear Motion Slide Unit, which could allow precisely defined movement. I wonder how the parts work in practice, comments on the X-Y Plotter are given in the Forum link from the website including 'I have some vibration and friction problems, but it works!'.

Makeblock
CONSTRUCT YOUR DREAMS

FORKLIFT

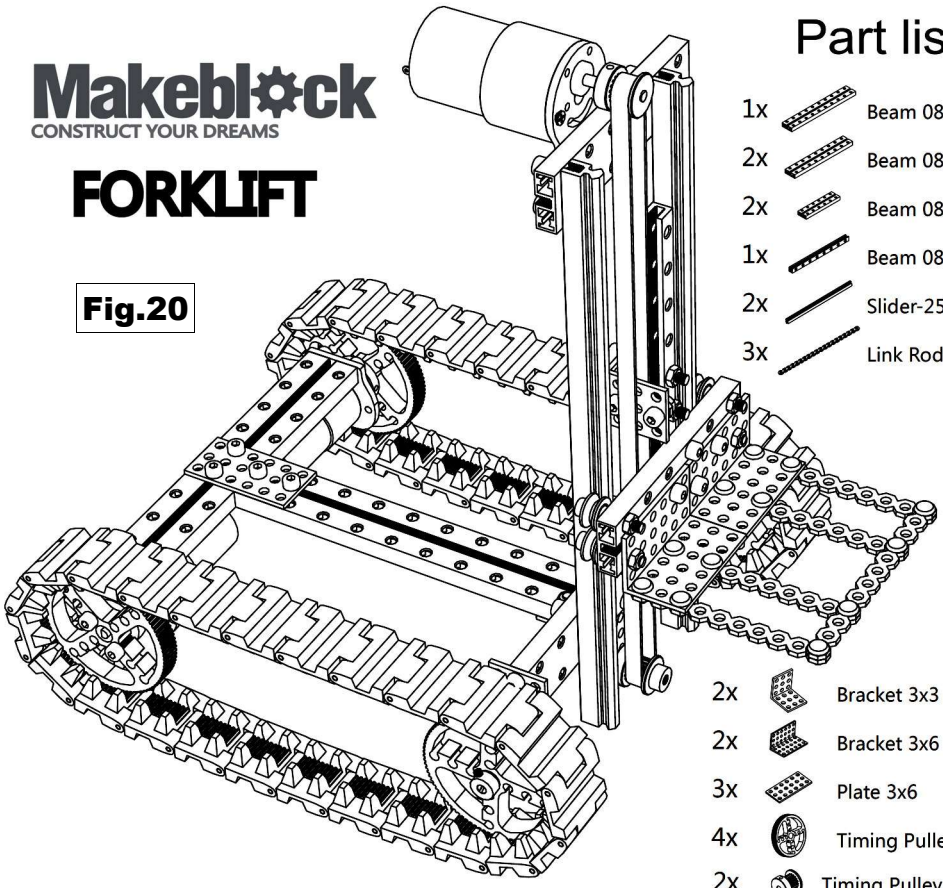


Fig.20

Part list

- 1x Beam 0824-160
- 2x Beam 0824-144
- 2x Beam 0824-96
- 1x Beam 0808-128
- 2x Slider-256
- 3x Link Rod
- 2x Bracket 3x3
- 2x Bracket 3x6
- 3x Plate 3x6
- 4x Timing Pulley 90T
- 2x Timing Pulley 18T
- 2x DC Motor-25 Bracket
- 1x DC Motor-37 Bracket
- 2x DC Motor-25
- 1x DC Motor-37
- 48x Track
- 48x Track Axle
- 2x Shaft Connector-4
- 5x Threaded Shaft 4X31mm
- 4x V-slot Bearing
- 4x Flange Bearing 4x8x3mm
- 5x Shaft Collar 4mm
- 15x Nut M4
- 6x Countersunk Screw M3x8
- 8x Headless Screw M3×5
- 6x Screw M4x22
- 18x Screw M4X14
- 18x Screw M4x8
- 20x Plastic Ring 4x7x2
- 12x Plastic Rivet R4060
- 1x Timing Belt 378T

Makeblock
CONSTRUCT YOUR DREAMS

4 LEGGED ROBOT

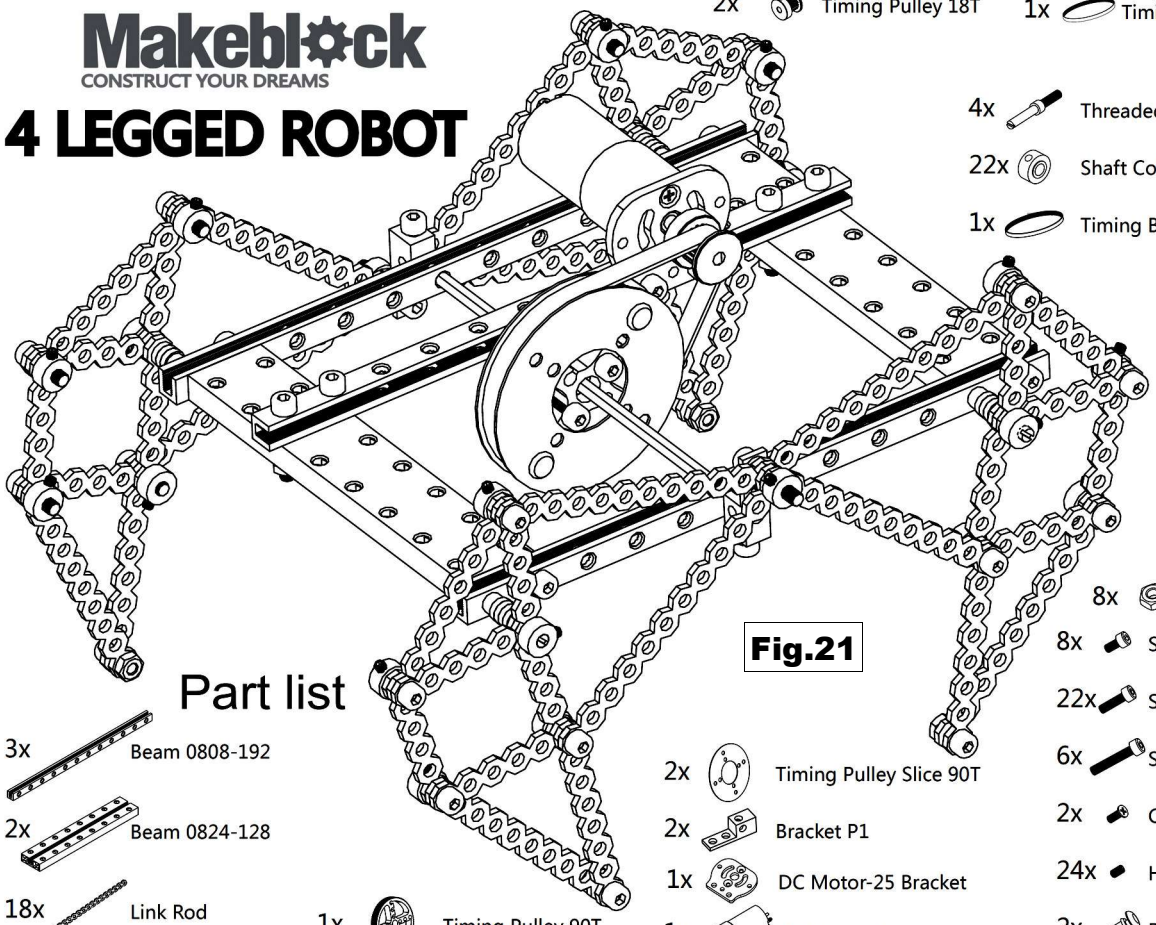


Fig.21

Part list

- 3x Beam 0808-192
- 2x Beam 0824-128
- 18x Link Rod
- 1x D Shaft 4x160mm
- 1x Timing Pulley 90T
- 1x Timing Pulley 18T
- 4x Threaded Shaft 4x31mm
- 22x Shaft Collar 4mm
- 1x Timing Belt 123T
- 2x Timing Pulley Slice 90T
- 2x Bracket P1
- 1x DC Motor-25 Bracket
- 1x DC Motor-25
- 1x Shaft Connector-4
- 8x Nut M4
- 8x Screw M4x8
- 22x Screw M4X14
- 6x Screw M4x22
- 2x Countersunk Screw M3x8
- 24x Headless Screw M3×5
- 2x Plastic Rivet R4120
- 16x Plastic Ring 4x7x2