

**CPC****COOPERATIVE PATENT CLASSIFICATION****B25J**

**MANIPULATORS; CHAMBERS PROVIDED WITH MANIPULATION DEVICES** ({ manipulators specially adapted for use in surgery [A61B 19/00M](#); manipulators used in cleaning hollow articles [B08B 9/04](#)}; manipulators associated with rolling mills [B21B 39/20](#); manipulators associated with forging machines [B21J 13/10](#); { manipulators associated with picking-up and placing mechanisms [B23P 19/007](#)}; means for holding wheels or parts thereof [B60B 30/00](#); { vehicles with ground-engaging propulsion means, e.g. walking members [B62D 57/02](#), [B62D 57/032](#); devices for picking-up and depositing articles or materials between conveyers [B65G 47/90](#), [B65G 47/91](#); manipulators with gripping or holding means for transferring packages [B65H 67/065](#)}; cranes [B66C](#); { manipulators used in the protection or supervision of pipe-line installations [F17D 5/00](#); walking equipment adapted for nuclear steam-generators [F22B 37/006](#)}; manipulators specially adapted for, or associated with, nuclear reactors [G21C](#); { apparatus used for handling wafers during manufacture or treatment of semiconductor [H01L 21/68](#)})

**NOTE**

In this subclass, the following term is used with the meaning indicated :

- "manipulator" covers handling tools, devices, or machines having a gripping or work head capable of bodily movement in space and of change of orientation, such bodily movement and change of orientation being controlled, at will, by means remote from the head.

**WARNING**

[B25J 9/18](#) covered by [B25J 9/16](#)  
[B25J 9/22](#) " " [B25J 9/16P](#), [G05B 19/42](#)

**B25J 1/00**

**Manipulators positioned in space by hand** (of master-slave type [B25J 3/00](#); micromanipulators [B25J 7/00](#))

## B25J 1/02

. articulated or flexible

## B25J 1/04

. rigid, e.g. shelf-reachers {(without grippers [A47F 13/06](#))}

## B25J 1/06

. of the lazy-tongs type

## B25J 1/08

. movably mounted in a wall

## B25J 1/10

. . Sleeve and pivot mountings therefor

## B25J 1/12

. having means for attachment to a support stand

**B25J 3/00**

**Manipulators of master-slave type, i.e. both controlling unit and controlled unit**

**perform corresponding spatial movements**

- B25J 3/02 . involving a parallelogram coupling of the master and slave units ([pantographic instruments B43L 13/00](#))
- B25J 3/04 . involving servo mechanisms ([servo-actuated heads B25J 15/02](#))
- B25J 5/00** **Manipulators mounted on wheels or on carriages** ([B25J 1/00](#) takes precedence; programme-controlled manipulators [B25J 9/00](#); {vehicle aspects [B60](#), [B62](#), e.g. remote-controlled steering for motor vehicles [B62D 1/24](#); control of position of vehicles [G05D 1/00](#)})
- B25J 5/002 . { mounted on an air cushion}
- B25J 5/005 . {mounted on endless tracks or belts}
- B25J 5/007 . {mounted on wheels}
- B25J 5/02 . travelling along a guideway
- B25J 5/04 . . wherein the guideway is also moved, e.g. travelling crane bridge type
- B25J 5/06 . Manipulators combined with a control cab for the operator
- B25J 7/00** **Micromanipulators** {(specimen supports for investigating or analysing materials [G01N 23/2204](#); associated with microscopes [G02B 21/32](#); means for supporting or positioning the objects or the material in discharge tubes [H01J 37/20](#))}
- B25J 9/00** **Programme-controlled manipulators**
- B25J 9/0003 . {Home robots, i.e. small robots for domestic use}
- B25J 9/0006 . {Exoskeletons, i.e. resembling a human figure}
- B25J 9/0009 . {Constructional details, e.g. manipulator supports, bases}
- B25J 9/0012 . . {making use of synthetic construction materials, e.g. plastics, composites}
- B25J 9/0015 . . { Flexure members, i.e. parts of manipulators having a narrowed section allowing articulation by flexion}
- B25J 9/0018 . . { Bases fixed on ceiling, i.e. upside down manipulators}
- B25J 9/0021 . . { All motors in base}
- B25J 9/0024 . . { Wrist motors at rear part of the upper arm}
- B25J 9/0027 . . { Means for extending the operation range}
- B25J 9/003 . { having parallel kinematics}
- B25J 9/0033 . . { with kinematics chains having a prismatic joint at the base}
- B25J 9/0036 . . . { with kinematics chains of the type prismatic-rotary-rotary}
- B25J 9/0039 . . . { with kinematics chains of the type prismatic-spherical-spherical}

- B25J 9/0042 . . . { with kinematics chains of the type prismatic-universal-universal}
- B25J 9/0045 . . { with kinematics chains having a rotary joint at the base}
- B25J 9/0048 . . . { with kinematics chains of the type rotary-rotary-rotary}
- B25J 9/0051 . . . { with kinematics chains of the type rotary-universal-universal or rotary-spherical-spherical, e.g. Delta type manipulators}
- B25J 9/0054 . . { with kinematics chains having a spherical joint at the base}
- B25J 9/0057 . . . { with kinematics chains of the type spherical-prismatic-spherical}
- B25J 9/006 . . . { with kinematics chains of the type spherical-prismatic-universal}
- B25J 9/0063 . . { with kinematics chains having an universal joint at the base}
- B25J 9/0066 . . . { with kinematics chains of the type universal-prismatic-spherical}
- B25J 9/0069 . . . { with kinematics chains of the type universal-prismatic-universal}
- B25J 9/0072 . . { of the hybrid type, i.e. having different kinematics chains}
- B25J 9/0075 . . { Truss}
- B25J 9/0078 . . { actuated by cables}
  
- B25J 9/0081 . {with master teach-in means}
  
- B25J 9/0084 . {comprising a plurality of manipulators}
- B25J 9/0087 . . { Dual arms (double SCARA arms [B25J 9/043](#))}
- B25J 9/009 . . { being mechanically linked with one another at their distal ends}
  
- B25J 9/0093 . {co-operating with conveyer means}
  
- B25J 9/0096 . {co-operating with a working support, e.g. work-table}
  
- B25J 9/02 . characterised by movement of the arms, e.g. cartesian coordinate type ([B25J 9/06 takes precedence](#))
- B25J 9/023 . . {Cartesian coordinate type}
- B25J 9/026 . . . {Gantry-type}
- B25J 9/04 . . by rotating at least one arm, excluding the head movement itself, e.g. cylindrical coordinate type or polar coordinate type
- B25J 9/041 . . . {Cylindrical coordinate type}
- B25J 9/042 . . . . {comprising an articulated arm}
- B25J 9/043 . . . . . { double SCARAR arms}
- B25J 9/044 . . . . . { with forearm providing vertical linear movement}
- B25J 9/045 . . . {Polar coordinate type}
- B25J 9/046 . . . {Revolute coordinate type}
- B25J 9/047 . . . . {the pivoting axis of the first arm being offset to the vertical axis}
- B25J 9/048 . . . {Pendulum type}
  
- B25J 9/06 . characterised by multi-articulated arms
- B25J 9/065 . . { Snake robots}
  
- B25J 9/08 . characterised by modular constructions
  
- B25J 9/10 . characterised by positioning means for manipulator elements

- B25J 9/1005 .. {comprising adjusting means}
- B25J 9/101 ... {using limit-switches, -stops}
- B25J 9/1015 ... {using additional, e.g. micro adjustment of the end effector}
- B25J 9/102 .. {Gears specially adapted therefor, e.g. reduction gears (gearings in general [F16H](#))}
- B25J 9/1025 ... {Harmonic drives (in general: [F16H 49/001](#))}
- B25J 9/103 ... {with backlash-preventing means}
- B25J 9/1035 ... {Pinion and fixed rack drivers, e.g. for rotating an upper arm support on the robot base}
- B25J 9/104 .. {with cables, chains or ribbons}
- B25J 9/1045 ... {comprising tensioning means}
- B25J 9/105 .. {using eccentric means ([B25J 9/109](#) takes precedence)}
- B25J 9/1055 .. {by gravity}
- B25J 9/106 .. {with articulated links}
- B25J 9/1065 ... {with parallelograms}
- B25J 9/107 ..... {of the froglegs type}
- B25J 9/1075 .. {with muscles or tendons}
- B25J 9/108 .. {Bearings specially adapted therefor (bearings in general [F16C](#))}
- B25J 9/1085 .. {positioning by means of shape-memory materials (shape memory actuators [F03G 7/06](#))}
- B25J 9/109 .. {comprising mechanical programming means, e.g. cams}
- B25J 9/1095 .. {chemically actuated}
- B25J 9/12 .. electric
- B25J 9/123 ... {Linear actuators}
- B25J 9/126 ... {Rotary actuators}
- B25J 9/14 .. fluid
- B25J 9/142 ... {comprising inflatable bodies}
- B25J 9/144 ... {Linear actuators}
- B25J 9/146 ... {Rotary actuators}
- B25J 9/148 ..... {of the oscillating vane-type (in general [F15B 15/12](#))}
- B25J 9/16 . Programme controls (programme controls in general [G05B 19/00](#), e.g. numerical programme controls [G05B 19/18](#); {recording or playback systems [G05B 19/42](#)})
- B25J 9/1602 .. {characterised by the control system, structure, architecture}
- B25J 9/1605 ... {Simulation of manipulator lay-out, design, modelling of manipulator}
- B25J 9/1607 ... {Calculation of inertia, jacobian matrixes and inverses}
- B25J 9/161 ... {Hardware, e.g. neural networks, fuzzy logic, interfaces, processor}
- B25J 9/1612 .. {characterised by the hand, wrist, grip control}
- B25J 9/1615 .. {characterised by special kind of manipulator, e.g. planar, scara, gantry, cantilever, space, closed chain, passive/active joints and tendon driven manipulators}
- B25J 9/1617 ... {Cellular, reconfigurable manipulator, e.g. cebot}
- B25J 9/162 ... {Mobile manipulator, movable base with manipulator arm mounted on it}
- B25J 9/1623 ... {Parallel manipulator, Stewart platform, links are attached to a common base and to a common platform, plate which is moved parallel to the base}
- B25J 9/1625 ... {Truss-manipulator for snake-like motion}

B25J 9/1628	..	{characterised by the control loop}
B25J 9/163	...	{learning, adaptive, model based, rule based expert control}
B25J 9/1633	...	{compliant, force, torque control, e.g. combined with position control}
B25J 9/1635	...	{flexible-arm control}
B25J 9/1638	...	{compensation for arm bending/inertia, pay load weight/inertia}
B25J 9/1641	...	{compensation for backlash, friction, compliance, elasticity in the joints}
B25J 9/1643	...	{redundant control}
B25J 9/1646	...	{variable structure system, sliding mode control}
B25J 9/1648	...	{non-linear control combined or not with linear control}
B25J 9/1651	...	{acceleration, rate control}
B25J 9/1653	...	{parameters identification, estimation, stiffness, accuracy, error analysis}
B25J 9/1656	..	{characterised by programming, planning systems for manipulators}
B25J 9/1658	...	{characterised by programming language}
B25J 9/1661	...	{characterised by task planning, object-oriented languages}
B25J 9/1664	...	{characterised by motion, path, trajectory planning}
B25J 9/1666	.....	{Avoiding collision or forbidden zones}
B25J 9/1669	...	{characterised by special application, e.g. multi-arm co-operation, assembly, grasping}
B25J 9/1671	...	{characterised by simulation, either to verify existing program or to create and verify new program, CAD/CAM oriented, graphic oriented programming systems}
B25J 9/1674	..	{characterised by safety, monitoring, diagnostic}
B25J 9/1676	...	{Avoiding collision or forbidden zones}
B25J 9/1679	..	{characterised by the tasks executed}
B25J 9/1682	...	{Dual arm manipulator; Coordination of several manipulators}
B25J 9/1684	...	{Tracking a line or surface by means of sensors}
B25J 9/1687	...	{Assembly, peg and hole, palletising, straight line, weaving pattern movement}
B25J 9/1689	...	{Teleoperation}
B25J 9/1692	...	{Calibration of manipulator}
B25J 9/1694	..	{characterised by use of sensors other than normal servo-feedback from position, speed or acceleration sensors, perception control, multi-sensor controlled systems, sensor fusion}
B25J 9/1697	...	{Vision controlled systems}
B25J 9/20	..	fluidic

### **B25J 11/00 Manipulators not otherwise provided for**

B25J 11/0005	.	{ Manipulators having means for high-level communication with users, e.g. speech generator, face recognition means}
B25J 11/001	..	{ with emotions simulating means}
B25J 11/0015	..	{ Face robots, animated artificial faces for imitating human expressions}
B25J 11/002	.	{ Manipulators for defensive or military tasks}
B25J 11/0025	..	{ handling explosives, bombs or hazardous objects}

- B25J 11/003 . { Manipulators for entertainment}
- B25J 11/0035 .. { Dancing, executing a choreography}
- B25J 11/004 .. { Playing a music instrument}
  
- B25J 11/0045 . { Manipulators used in the food industry}
  
- B25J 11/005 . { Manipulators for mechanical processing tasks}
- B25J 11/0055 .. { Cutting}
- B25J 11/006 .. { Deburring or trimming}
- B25J 11/0065 .. { Polishing or grinding}
- B25J 11/007 .. { Riveting}
  
- B25J 11/0075 . { Manipulators for painting or coating}
  
- B25J 11/008 . { Manipulators for service tasks}
- B25J 11/0085 .. { Cleaning}
- B25J 11/009 .. { Nursing, e.g. carrying sick persons, pushing wheelchairs, distributing drugs}
  
- B25J 11/0095 . { Manipulators transporting wafers}
  
- B25J 13/00** **Controls for manipulators** (programme controls [B25J 9/16](#); control in general [G05](#))
  
- B25J 13/003 . {by means of an audio-responsive input (audible safety signals [B25J 19/061](#))}
  
- B25J 13/006 . { by means of a wireless system for controlling one or several manipulators}
  
- B25J 13/02 . Hand grip control means {(handles or pedals for crane control [B66C 13/56](#); for measuring the force applied to control members [G01L 5/22](#); hand-held casings for switching devices, e.g. joy-sticks [H01H 9/0214](#))}
- B25J 13/025 .. { comprising haptic means}
  
- B25J 13/04 . Foot-operated control means
  
- B25J 13/06 . Control stands, e.g. consoles, switch-boards
- B25J 13/065 .. {comprising joy-sticks}
  
- B25J 13/08 . by means of sensing devices, e.g. viewing or touching devices
- B25J 13/081 .. {Touching devices, e.g. pressure-sensitive}
- B25J 13/082 ... {Grasping-force detectors (in general [G01L 5/16](#), [G01L 5/22](#))}
- B25J 13/083 .... {fitted with slippage detectors}
- B25J 13/084 ... {Tactile sensors (in general [G01L 5/16](#), [G01L 5/22](#))}
- B25J 13/085 .. {Force or torque sensors ([B25J 13/082](#), [B25J 13/084](#) take precedence)}
- B25J 13/086 .. {Proximity sensors}
- B25J 13/087 .. {for sensing other physical parameters, e.g. electrical or chemical properties}
- B25J 13/088 .. {with position, velocity or acceleration sensors}
- B25J 13/089 ... {Determining the position of the robot with reference to its environment}

- B25J 15/00**      **Gripping heads** { and other end effectors (grippers used in machine tools [B23Q 7/04](#); gripping members fitted on cranes [B66C 1/42](#), [B66C 1/44](#); gripping means used in the manufacture of semiconductors {[H01L 21/68707](#)}; gripping means used for mounting electrical components [H05K 13/04](#))}
- [B25J 15/0004](#)      . {with provision for adjusting the gripped object in the hand}
- [B25J 15/0009](#)      . {comprising multi-articulated fingers, e.g. resembling a human hand}
- [B25J 15/0014](#)      . { having fork, comb or plate shaped means for engaging the lower surface on a object to be transported}
- [B25J 15/0019](#)      . {End effectors other than grippers}
- [B25J 15/0023](#)      . {Gripper surfaces directly activated by a fluid (flexible fingers [B25J 15/12](#))}
- [B25J 15/0028](#)      . {with movable, e.g. pivoting gripping jaw surfaces}
- [B25J 15/0033](#)      . { with gripping surfaces having special shapes}
- [B25J 15/0038](#)      ..    { Cylindrical gripping surfaces}
- [B25J 15/0042](#)      ..    { V-shaped gripping surfaces}
- [B25J 15/0047](#)      . { for internally gripping hollow or recessed objects}
- [B25J 15/0052](#)      . { multiple gripper units or multiple end effectors}
- [B25J 15/0057](#)      ..    { mounted on a turret}
- [B25J 15/0061](#)      ..    { mounted on a modular gripping structure}
- [B25J 15/0066](#)      ..    { with different types of end effectors, e.g. gripper and welding gun ([B25J 15/0057](#) and [B25J 15/0061](#) take precedence)}
- [B25J 15/0071](#)      . { with needles engaging into objects to be gripped}
- [B25J 15/0076](#)      . { with means, e.g. Pelletier elements, for freezing a fluid interface between the gripping head and an object to be gripped}
- [B25J 15/008](#)      . { with sticking, gluing or adhesive means}
- [B25J 15/0085](#)      . { with means for applying an electrostatic force on the object to be gripped}
- [B25J 15/009](#)      . { with pins for accurately positioning the object on the gripping head}
- [B25J 15/0095](#)      . { with an external support, i.e. a support which does not belong to the manipulator or the object to be gripped, e.g. for maintaining the gripping head in an accurate position, guiding it or preventing vibrations}
- [B25J 15/02](#)      . servo-actuated
- [B25J 15/0206](#)      ..    {comprising articulated grippers}
- [B25J 15/0213](#)      ...    {actuated by gears}
- [B25J 15/022](#)      ...    {actuated by articulated links}

- B25J 15/0226 . . . {actuated by cams}
- B25J 15/0233 . . . { actuated by chains, cables or ribbons}
- B25J 15/024 . . . { having fingers directly connected to actuator}
- B25J 15/0246 . . { actuated by an electromagnet}
- B25J 15/0253 . . {comprising parallel grippers}
- B25J 15/026 . . . {actuated by gears}
- B25J 15/0266 . . . {actuated by articulated links}
- B25J 15/0273 . . . . {comprising linear guide means}
- B25J 15/028 . . . {actuated by cams}
- B25J 15/0286 . . . { actuated by chains, cables or ribbons}
- B25J 15/0293 . . . { having fingers directly connected to actuator}
  
- B25J 15/04 . . with provision for the remote detachment or exchange of the head or parts thereof
- B25J 15/0408 . . { Connections means}
- B25J 15/0416 . . . { having balls}
- B25J 15/0425 . . . { having cams}
- B25J 15/0433 . . . { having gripping members}
- B25J 15/0441 . . . { having vacuum or magnetic means}
- B25J 15/045 . . . { having screw means}
- B25J 15/0458 . . . { having a frustoconical member}
- B25J 15/0466 . . { with means for checking exchange completion}
- B25J 15/0475 . . {Exchangeable fingers}
- B25J 15/0483 . . { with head identification means}
- B25J 15/0491 . . {comprising end-effector racks}
  
- B25J 15/06 . . with vacuum or magnetic holding means
- B25J 15/0608 . . {with magnetic holding means}
- B25J 15/0616 . . {with vacuum}
- B25J 15/0625 . . . { provided with a valve}
- B25J 15/0633 . . . . { Air-flow-actuated valves}
- B25J 15/0641 . . . . { Object-actuated valves}
- B25J 15/065 . . . { provided with separating means for releasing the gripped object after suction}
- B25J 15/0658 . . . . { Pneumatic type, e.g. air blast or overpressure}
- B25J 15/0666 . . . . { Other types, e.g. pins or springs}
- B25J 15/0675 . . . { of the ejector type}
- B25J 15/0683 . . . { Details of suction cup structure, e.g. grooves or ridges}
- B25J 15/0691 . . . { Suction pad made out of porous material, e.g. sponge or foam}
  
- B25J 15/08 . . having finger members ([B25J 15/02](#), [B25J 15/04](#) take precedence)
- B25J 15/083 . . { with means for locking the fingers in an open or closed position}
- B25J 15/086 . . { with means for synchronizing the movements of the fingers}
- B25J 15/10 . . with three or more finger members {([B25J 15/0009](#) takes precedence)}
- B25J 15/103 . . . {for gripping the object in three contact points}

- B25J 15/106 . . . {moving in parallel relationship}
- B25J 15/12 .. with flexible finger members

**B25J 17/00****Joints**

- B25J 17/02 . Wrist joints
- B25J 17/0208 .. {Compliance devices}
- B25J 17/0216 ... {comprising a stewart mechanism}
- B25J 17/0225 ... { with axial compliance, i.e. parallel to the longitudinal wrist axis}
- B25J 17/0233 ... { with radial compliance, i.e. perpendicular to the longitudinal wrist axis}
- B25J 17/0241 .. {One-dimensional joints}
- B25J 17/025 ... {mounted in series}
- B25J 17/0258 .. {Two-dimensional joints}
- B25J 17/0266 ... {comprising more than two actuating or connecting rods}
- B25J 17/0275 ... {Universal joints, e.g. Hooke, Cardan, ball joints}
- B25J 17/0283 .. {Three-dimensional joints}
- B25J 17/0291 ... { having axes crossing at an oblique angle, i.e. other than 90 degrees}

**B25J 18/00****Arms**

- B25J 18/002 . {comprising beam bending compensation means}
- B25J 18/005 . { having a curved shape}
- B25J 18/007 . {the end effector rotating around a fixed point}
- B25J 18/02 . extensible
- B25J 18/025 .. {telescopic}
- B25J 18/04 .. rotatable
- B25J 18/06 . flexible

**B25J 19/00**

**Accessories fitted to manipulators, e.g. for monitoring, for viewing; Safety devices combined with or specially adapted for use in connection with manipulators**  
 (safety-devices in general [F16P](#); protection against radiation in general [G21F](#))

- B25J 19/0004 . {Braking devices (brakes in general [F16D](#))}
- B25J 19/0008 . {Balancing devices}
- B25J 19/0012 .. {using fluidic devices}
- B25J 19/0016 .. {using springs}
- B25J 19/002 .. {using counterweights}
- B25J 19/0025 . {Means for supplying energy to the end effector}
- B25J 19/0029 .. {arranged within the different robot elements}

- B25J 19/0033 . . . { with axial connectors in end effector flange}
- B25J 19/0037 . . . {comprising a light beam pathway, e.g. laser}
- B25J 19/0041 . . . { having rotary connection means}
- B25J 19/0045 . . { Contactless power transmission, e.g. by magnetic induction}
  
- B25J 19/005 . . {using batteries, e.g. as a back-up power source}
  
- B25J 19/0054 . . {Cooling means}
  
- B25J 19/0058 . . { Means for cleaning manipulators, e.g. dust removing means}
  
- B25J 19/0062 . . { Lubrication means}
  
- B25J 19/0066 . . { Means or methods for maintaining or repairing manipulators}
  
- B25J 19/007 . . { Means or methods for designing or fabricating manipulators}
  
- B25J 19/0075 . . {Means for protecting the manipulator from its environment or vice versa}
- B25J 19/0079 . . {using an internal pressure system}
- B25J 19/0083 . . {using gaiters}
- B25J 19/0087 . . { using an antibacterial coating}
  
- B25J 19/0091 . . {Shock absorbers (in general [F16F](#))}
  
- B25J 19/0095 . . { Means or methods for testing manipulators}
  
- B25J 19/02 . . Sensing devices
- B25J 19/021 . . {Optical sensing devices}
- B25J 19/022 . . . {using lasers}
- B25J 19/023 . . . {including video camera means}
- B25J 19/025 . . . {including optical fibres}
- B25J 19/026 . . {Acoustical sensing devices}
- B25J 19/027 . . {Electromagnetic sensing devices}
- B25J 19/028 . . {Piezoresistive or piezoelectric sensing devices}
- B25J 19/04 . . Viewing devices
  
- B25J 19/06 . . Safety devices
- B25J 19/061 . . {with audible signals (audio controls [B25J 13/003](#))}
- B25J 19/063 . . {working only upon contact with an outside object}
- B25J 19/065 . . . { Mechanical fuse}
- B25J 19/066 . . { Redundant equipment}
- B25J 19/068 . . { Actuating means with variable stiffness}
  
- B25J 21/00** **Chambers provided with manipulation devices** (constructional features of the mounting of the manipulator in the wall [B25J 1/08](#); {glove-boxes for nuclear applications [G21F 7/04](#)})

B25J 21/005

- {Clean rooms}

B25J 21/02

- Glove-boxes, i.e. chambers in which manipulations are performed by the human hands in gloves built into the chamber walls {(glove- boxes for removal of dirt [B08B 15/026](#); glove-boxes shielded against radiation [G21F 7/04](#))}; Gloves therefor