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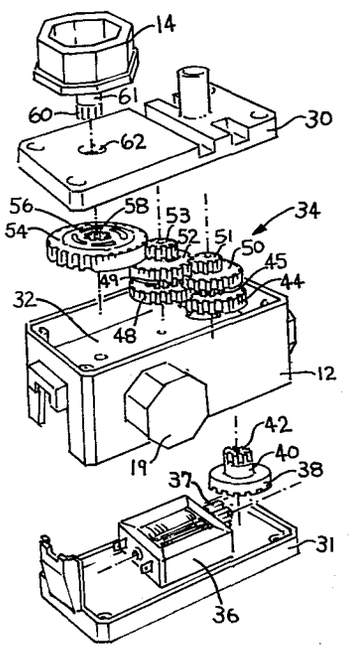
(71) Applicant: **Mawdsley, Brian, 43 Oaklands Drive, Westone Northampton NN3 3JN (GB)**

(72) Inventor: **Mawdsley, Brian, 43 Oaklands Drive, Westone Northampton NN3 3JN (GB)**

(74) Representative: **Jennings, Guy Kenneth et al, GILL JENNINGS & EVERY 53-64 Chancery Lane, London WC2A 1HN (GB)**

(54) Toys or models.

(57) A motor unit comprises a motor (36) and speed reduction gearing (34) enclosed within a housing (12) including side covers (31) and (32). The gearing (34) leads to a low speed output suitable for robotic operation of toys or models, the gearing being permanently connected to a driving part in the form of a hub (14) shaped to form a female octagonal connector. The housing also carries an octagonal male connector (19) and a female connector (not seen) the connectors on the housing and the driving part being identical or mutually compatible and forming part of a single universal system of connectors used throughout all the components of a construction kit.



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BRIAN MAWDSLEY

TOYS OR MODELS

This invention relates to toys or models, particularly those of the kind referred to as robotics. The invention is primarily concerned with kits of parts for the construction of such toys or models, with particular reference to motor units forming part of such kits for driving the toys or models constructed therefrom.

Previous proposals relating to robotic toys or models include various types of remote-controlled apparatus including robot arms and radio controlled cars and robot figures. These toys or models are capable of varying degrees of remote control and independent operation, but though some of them are of a considerable degree of sophistication, all provide for only a limited degree of participation by the user in playing with the toy. The user is limited to those precise functions and layouts which the designer of the toy has provided and cannot significantly adapt the toy to the user's own particular inclination.

It is therefore an object of the invention to provide a construction kit including at least two motor units for the construction of improved

toys of models offering one or more improvements in the above respects.

According to the invention, a low speed motor unit for a toy or model comprises a motor and speed reduction gearing enclosed within a housing and permanently connected to a driving part projecting from the housing, the unit including at least two identical or mutually compatible male/female connectors, preferably of the polygonal or square type, one of which is on the housing and one on the driving part. The driving part may be a hub on which one of the connectors is provided and this hub may itself be shaped to form the connector. As a result, a component provided with one or more connectors which are compatible with those on the motor unit may be connected to either the housing of the motor unit or to the driving part with the same connector. Moreover, by providing similar connectors on some or all of the components of the kit, these components can be connected to the motor unit or to one another as required.

Expressed in other terms, a single, universal system of connectors is used throughout the components of a complete construction kit, and hence throughout all the toys or models which can be constructed from that kit, so that connections can be made between fixed and driving/driven parts without the need to discriminate between different types of connectors. This is in complete

contrast to previous forms of constructional toys or models or construction kits where fundamentally different types of connectors have always been used for fixed and driving connections. Thus, although push-on, easily removable connections between fixed parts are commonplace, connections to driving parts have always been of a different nature. In particular, connections to rotary shafts have always been through gearing, belt drives and so forth.

One particular advantage of a construction in accordance with the invention is that it leads to the production of toys or models each comprising at least two motor units, which are independently controllable and connected so that actuation of one motor unit effects bodily movement of the other motor unit or units. A toy or model constructed in this way is particularly versatile and leads to a far greater degree of participation by the user in playing with the toy than has previously been possible. A single kit of parts can be used to produce a wide variety of such toys or models, not only in accordance with set designs which may form part of the instructions to the user, but also in accordance with designs which can be assembled in accordance with the user's own designs and which thus give wide rein to his imagination and creative abilities.

The use of the same connectors for

connection to the moving parts as to the fixed parts is of particular importance in the toys or models constructed in accordance with the invention in view of the inclusion of the much larger number of motor units for powering individual components than in previous toys or models where anything more than a single motor unit is most unusual. When incorporating a number of motor units in a toy or model according to the invention, the facility of being able to use the same connectors throughout is particularly advantageous.

One particular advantage of a motor unit in accordance with the present invention is that a single standard design of unit may be used for all the different driving functions which may be necessary in a toy or model Thus if, for example, a rotary arm drive is required, an arm may be connected to a hub on the output shaft or to the shaft itself and the component to be driven is then connected to the arm by means of an identical type of connector. Exactly the same applies to a wheel unit, linear drive unit and so forth, even including a second motor unit.

A motor unit in accordance with the invention may form the main constituent of a linear drive unit which, in addition to the motor unit, comprises a toothed pinion connected to the driving part and meshing with a rack

member capable of sliding movement in a guide connected to the housing. The linear sliding movement of the rack member may then be used to provide linear drive to a further component or components which may be connected to the rack member by the system of connectors already referred to. For example, a pair of interconnected linear drive units as just described may form the basis for drawing apparatus. The purpose of such apparatus is to drive a writing instrument in mutually perpendicular X and Y directions in relation to a record surface, and for this purpose the two linear drive units have their rack members respectively parallel to the X and Y directions, that of the first linear drive unit being fixed so that the motor unit is driven along it, and this motor unit then carries the motor unit of the second linear drive unit, so that the associated rack member is driven in the Y direction and carries at its end a mounting for a writing instrument. In other words, any required movement of the writing instrument in the X direction is controlled by the first linear drive unit, and any required movement in the Y direction is controlled by the second linear drive unit.

Whether the ultimate drive is a rotary one or a linear one, the actual speed of the drive is found to be of primary importance since the speed of turning movement of a robot

arm, for example, requires to be very much slower than the output speed of other commonly available toy motor units. Similarly, the linear output speed of a linear drive unit such as used in the construction of drawing apparatus, as just described, requires to be extremely slow in relation to that of comparable members of other toys.

It is thus an important feature of the invention that the rotary or angular output speed of a motor unit in accordance with the invention should be within the range of ninety degrees in a time period of one to thirty seconds. Similarly, for linear or substantially linear motion, the speed should be in the range of 0.1 to 4.0 centimetres per second, the most useful part of this range being from 0.5 to 3 centimetres per second. As will be described later, the motor unit needs to be carefully designed to give speeds within these ranges. Not only are these speeds important in themselves in providing effective and realistic operation of the toys or models, but the resultant increase in torque associated with the low speed is of great practical importance.

In some cases, a component will not need to be fitted directly to a motor unit, but to be spaced at a distance from it. To allow for this, connecting members, e.g. in the form of arms, may be included, with connectors at opposite ends and also, if required, on

opposite sides. A further important feature of the overall design is that the spacing of connectors both on the motor units, on components which are designed to be connected to the motor unit and to one another, and also on connecting members as just described, should be arranged on a three-dimensional modular grid. In other words, the spacing between connectors in any of the three mutually perpendicular directions should be an integral number of arbitrary units so as to allow components and connecting members to be completely inter-changeable. For example, if two connecting members of different lengths are connected to a motor unit and are then connected either directly or indirectly through other members to a second component, the modular arrangement will ensure that the respective connectors will be located in the correct positions for making the required connections.

In view of the accurate speed requirements referred to above, and the complicated combinations of movement capable with a toy or model produced in accordance with the invention, accurate control of each motor unit is essential. Each motor unit needs to be reversible and the control of rotation in either direction may be carried out either manually, by means of an automatic programme which may be computer-generated, or under remote control, e.g. by way of radio signals. Since each individual motor unit in a toy or model needs to be independently

controllable, separate controls for each motor are necessary. Generally speaking, a construction kit will include only one of the three forms of control just referred to, but additional control units may be provided as optional extras.

Examples of motor unit in accordance with the invention together with examples of components which can be used in conjunction with these motor units, and also examples of toys or models which can be assembled using the motor units and other components, will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view of a motor unit with a separate rotary component shown in an exploded position;

Figure 2 is an exploded perspective view of the unit shown in Figure 1, illustrating the motor and reduction gearing;

Figures 3 and 4 are perspective views of alternative forms of motor unit;

Figure 5 is a further view of the motor unit shown in Figure 1 with a pair of grab arms and adapter unit in an exploded position;

Figure 6 is a perspective view of a linear drive unit incorporating a motor unit as shown in Figure 1;

Figure 7 is a perspective view of toy drawing apparatus incorporating a pair of linear

drive units such as shown in Figure 6;

Figure 8 is a perspective view of a connecting unit which is compatible with the motor unit shown in Figure 1;

Figure 9 is a perspective view of a similarly compatible base unit;

Figures 10, 11 and 12 are perspective views of connecting members which are compatible with the unit shown in Figure 1;

Figure 13 is a perspective view of a similarly compatible light unit;

Figure 14 is a perspective view of a toy grab unit assembled from components of the type previously illustrated and controlled by a manual keyboard; and

Figure 15 is a perspective view of a toy animal assembled from similar components.

Figure 1 shows a preferred form of motor unit in accordance with the invention including octagonal connectors which are compatible with the connectors shown in all the other Figures of the drawings with the exception of the units shown in Figures 3 and 4.

The unit comprises a housing 12 which includes a reversible direct current electric motor and a gear train as will be described in more detail in relation to Figure 2. The output of the gear train is transmitted to a hub 14 which is shaped to define a female connector 15 for the reception of a mating male connector

on any one of a number of components to be driven. As a general but not universal rule it is preferred that the output or driving connector should be female and the input or driven connector male.

Opposite sides of the housing 12 are fitted with a female connector 18 corresponding to the connector 15 and a compatible male connector 19; a male connector 16 is fitted to the housing at a point opposite the output shaft. A flying lead 20 fitted with a connection plug 21 is connected to the top of the housing 12 by way of a strain relief bush 22 so as to provide power to the motor. Alternatively a socket may be provided in the motor housing. The bottom of the housing 12 is fitted with a female connector 24 corresponding to the connectors 15 and 18.

The male and female connectors illustrated in Figure 1 form part of the single, universal system of connectors used throughout all the components of a complete construction kit for building various different toys or models, so that connections can be made between fixed and driving/driven parts without the need to discriminate between different types of connector. As can be seen from Figure 1, the connectors are octagonal in shape, but other forms of polygonal or square connectors are also possible, an important requirement being that all the connectors of any particular construction kit

should be compatible with one another. If, for example, the connectors on the motor unit are square, then all the connectors throughout the kit must also be square and compatible.

An example of a component which can be connected directly to the output connector 15 is a top hat gear 26 shown in an exploded position in Figure 1. This has a male connector (not seen) which fits the female connector 15 so that the gear can be plugged directly into the output off the unit. Any component requiring to be fixed to the housing 12 may be fitted either to one of the female connectors 18 and 24 or to one of the male connectors 16 and 19 according to the type of connector on the component which is most readily available.

The internal details of the unit shown in Figure 1 are illustrated in the exploded view of Figure 2. The housing 12 is closed at opposite sides by covers 30 and 31 shown removed in Figure 2 and includes a central partition 32 within which are formed bearings for the spindles (shown in dotted lines) of the various gear wheels of the reduction gearing indicated collectively as 34. An electric motor 36 is mounted on the inside of the cover 31 and its output shaft drives a pinion 37 meshing with a crown wheel 38. The crown wheel 38 has an integral hub 40 which runs in a bearing in the cover 32 and is formed with an integral pinion 42 which meshes with

a larger pinion 44. The pinion 44 is formed integrally with a smaller pinion 45. The pinion 45 meshes with a larger pinion 48 which has an integral smaller pinion 49 meshing with a pinion 50 having an integral smaller pinion 51. The pinion 51 meshes with a larger pinion 52 having an integral smaller pinion 53 which meshes with a larger pinion 54.

The central portion 56 of the pinion 54 is separate from the outer toothed portion and is connected to it by a friction clutch which can slip in the event of an over-load. The central portion 56 has an opening 58 shaped to engage with splines 60 on a shaft 61 running in a bearing 62 formed in the cover 30, the shaft 61 forming part of the hub 14 which represents the output of the unit as a whole.

It will thus be understood that the reduction gearing 34 comprises six successive stages of reduction, the first being from the pinion 37 to the crown wheel 38 and the remaining five resulting from the meshing of pairs of spur gears, i.e. 45:48, 49:50, 51:52, and 53:54. As explained above, the rotary speed of the output member is of major importance and the gearing is designed to give a final output speed of 6 rpm, i.e. a rotary movement of ninety degrees in a period of 2.5 seconds, i.e. towards the bottom of the range quoted above. The motor 36 is designed to run on a three volt

supply at a speed of 7750 rpm and the gear ratios are such as to give speeds for the successive gear wheels, as follows:-

	38, 42 :	3080 rpm
	44, 45 :	792 rpm
	48, 49 :	204 rpm
	50, 51 :	85 rpm
	52, 53 :	22 rpm
and	54, 14 :	6 rpm

which is the output speed quoted above. Not only does the gearing 34 lead to a major speed reduction, but there is a corresponding increase in the torque available which is a major factor in the design of robotic toys.

It will, of course, be understood that the nature of the gearing, the individual speeds at the various stages and the final output speed are quoted purely by way of example as representative of the order of speed required and the importance which is attached to this.

The motor unit shown in Figures 1 and 2 is designed to be universal in that it can be used to produce not only any form of rotary movement which is likely to be required in a model, but also linear movement as will be described later. However, the concept of universality is not an essential feature of the invention and the motor units shown in Figures 3 and 4 are each designed for a specific function. Thus the motor unit of Figure 3 and indicated

generally as 70 has an output member in the form of a rotary arm 72, and the unit of Figure 4 indicated generally as 80 is similar to that of Figures 1 and 2 in having its output member in the form of a hub 82. The internal details of these units are not illustrated, but may be similar to those illustrated in Figure 2.

A further feature of difference in the units of Figures 3 and 4 lies in the nature of the connections which are square rather than polygonal, but otherwise have all the characteristics described in detail in relation to Figure 1. Thus, the unit 70 of Figure 3 comprises square male connectors 76 and 78 projecting from the housing and a square female connector 74 at the end of the arm 72. As a result, components having male connectors similar to those shown at 76 and 78 can be fitted directly to the female connector 74 and other components having female connectors similar to the connector 74 can be fitted to the male connectors 76 and 78. Other components for use with the units of Figures 3 and 4 are not illustrated, but take the same general form as will be described later

in connection with components for use in conjunction with the unit of Figure 1 to give a single, universal system of connectors throughout the components of a complete construction kit.

Similarly, in Figure 4, the unit 80 has a pair of square male connectors 82 and 88 projecting from the housing and a square female connector 86 formed at the end of a square shaft 84 projecting from the hub 82.

Whether the connectors are square or polygonal, they are all capable of quick operation, that is to say of being quickly connected together by a simple pressing action and quickly detached from one another by a reverse operation. Both the connectors themselves and indeed the great majority of all the other components are conveniently moulded from plastic,and in order to give the connectors a slight degree of resilience, a suitable plastic is A.B.S. The connectors require to be accurately moulded to give a precise fit, and this is enhanced if each male connector is given an extremely slight taper.

Figure 6 shows the unit of Figure 5 in association with a pair of grab arms 96 and 98 which are inter-connected by a pin and slot connection 99, so that they turn in opposite senses. The arm 96 has a male connector 102 which co-operates with the female connector 15 of the unit and although the arm 98 has a similar connector 104 so that it can be connected in the same way as the arm 96 if required, this connector is not used as such, but instead a central bore (not seen) fits over a stationary peg 105 projecting from the housing 12 and seen also in Figure 1. Consequently, as the arm 96 is driven in one direction or the other by the motor unit, the arm 98 is caused to turn about the peg 105.

The male connector 19 on the housing 12 is located off-centre and if it is required to locate the grab unit so that it is centered on the common axis of the grab arms 96 and 98, an adapter 108 may be used. As can be seen, this includes a female socket or connector 109 which is located off-centre in a position corresponding to the connector 19, and a second, projecting male connector 110 which is centrally located. Accordingly, when the socket 109 is fitted to the connector 19, the female connector 110 is centrally located in relation to the motor unit and the combination of the unit plus the adapter may then be centrally located as required.

Figure 6 shows the unit of Figure 1

forming part of a linear drive unit. For this purpose, the gear 26 seen in Figure 1 is fitted to the hub 14 and meshes with a rack 120 formed in a member 121 which is guided by a retaining piece 122 which is a push-fit on the pin 105. Consequently, rotation of the gear 26 produces linear movement of the member 121 along the guide 122 with consequent linear movement of any other component or components connected to the member 121. A female connector which faces in an axial direction is shown at the right hand end of the member 121 and a second female connector 126 which faces upwardly on a short transverse arm 127 is shown at the left hand end of the member 121.

As mentioned previously, linear driving speed is as important as rotary driving speed and, using the figures quoted above, i.e. an output speed applied to the gear 26 of 6 rpm, the linear speed of the member 121 is 1 cm per sec. As also mentioned previously, this figure is quoted purely for the sake of example.

Figure 7 shows a practical example of the use of two linear drive units in accordance with Figure 6 in the form of drawing apparatus which produces movement of a writing instrument such as a pencil 130 in two directions at right angles, shown as the X direction and the Y direction. The pencil 130 co-operates with a sheet of record material such as thick paper 132 supported by

a base 133 which constitutes one of the components of the complete kit of parts referred to previously and which is formed with a series of female connectors 135 around its edges. Two of these connectors support the remainder of the drawing mechanism. Thus a pair of vertical arms 140 having male connectors at their lower ends are fitted into respective female connectors and support a linear drive mechanism similar to that shown in Figure 6 except that the member carrying the rack is formed at both ends with female connectors similar to those shown at 126 in Figure 6. The rack member is therefore held stationary, and rotation of the gear wheel 26 thus drives the complete motor unit along the rack member 121. The unit as a whole is indicated as 150 and has directly connected to it a second identical motor unit 152. Although the connectors between the two motors cannot be seen, it will be understood from a comparison with Figure 1 that the female connector 14 on the unit 150 is engaged with the male connector 16 of the unit 152.

The gear wheel 26A of the unit 152 drives a rack member 121A in a direction at right angles to the member 121. The rack member 121A has at its end a female connector similar to that shown as 125 in Figure 6 which connects a mounting 154 for the pencil 130. The motor unit 150 is connected to a supply battery and a controller by way of a pair of leads 156 and the motor unit

152 is similarly connected by leads 158. Accordingly, energisation of the unit 150 drives the pencil in the X direction, while energisation of the motor unit 152 drives it in the Y direction and by appropriate control, the pencil can be caused to describe any required curve, such as that shown in dotted lines at 160.

If a component is to be spaced away from its associated motor unit, a connecting arm may be used as illustrated in Figure 8. This is a relatively complicated component which has a female connector 170 at one end which can be fitted as required to either of the male connectors of the motor unit or indeed to any other male connector of any other component. The arm also includes laterally directed opposite pairs of male and female connectors indicated generally as 171 and 172, the type of connector being indicated by the conventional symbol. Rather simpler forms of connecting arm are shown in Figures 10, 11 and 12. Figure 10 shows a connecting elbow 175 having a male connector 176 at one end and a female connector 177 at the other end, turned through a right angle in relation to the male connector 176. Figure 11 shows a simple straight arm 180 with a male connector 181 at one end and a female connector 182 at the other end. Figure 12 shows a T-piece 185 having female connectors 186 and 187 at the two ends of the cross member of the T and a female connector 188 at the end

of the upright member of the T.

The lengths of all these connecting members shown in Figures 8, 10, 11 and 12 are selected in accordance with the modular spacing referred to above, so that when any connecting member is used, a component connected by it will be at the correct spacing. The same applies to the base member 190 shown in Figure 9 which is similar to that shown as 132 in Figure 7, and includes female connectors 192 around its edges and similar female connectors 194 on its upper surface, all arranged at a modular spacing.

Figure 13 shows an example of a further component which can be connected in position as part of the overall system, although it is not itself of a structural nature. The component 196 is in the form of a lamp having a body 198 which serves as a bulb holder, and a lens 200 which is focussed by means of a telescopic stem 199.The body 198 has an octagonal connector 202 which enables it to be connected directly to various of the components already described. The unit also includes an electrical connector 204 which is identical to that of the unit shown in Figure 1, so that the lamp may be controlled in the same way as the motor unit, as will be described in more detail with reference to Figure 15.

In Figure 14 a toy robot arm assembly is constructed from components most of which have already been described, but in addition, it includes a control keyboard 210 for remote manual control purposes. Power is supplied to the unit from batteries contained within a battery unit 212 which also serves as the base for the operational part of the assembly, including numerous male and female connectors for this purpose. Output from the battery unit passes via a main connecting lead 214 to the keyboard 210 where it is supplied to five separate channels, of which only numbers one to four are used for the assembly illustrated. Each channel includes a respective rocker switch 216 which has three separate positions, a central "off" position and forward and reverse positions reached by rocking the switch in one direction or the other from the central "off" position. Each channel has an associated socket for the reception of a plug connected to a supply lead 218 leading to the respective motor. Plugs 219 for channels one, two and three, are shown plugged into their sockets while plug 219 for channel four is ready to be plugged into position.

Instead of plugging the plugs 219 into a manual keyboard, they may be plugged into a radio control unit for remote control purposes or to the output of a computer for automatic control. The manual keyboard, the radio

control and the computer control are completely inter-changeable, thus leading to great versatility in the assembly and use of the toy.

The electrical supply leads 218 connect four separate motor units to the keyboard 210 for completely independent control. The first motor unit indicated at 220 is connected directly to the top of the battery unit 212 and its output hub faces upwardly where it is connected directly to the second motor unit shown as 222. The unit 220 therefore controls swivelling of the remainder of the robot arm assembly. The second motor unit 222 has its output hub 14 directed horizontally where it carries an arm of the type shown in Figure 8 and indicated as 224. Angular movements of this arm in a vertical plane are therefore controlled by the motor unit 222. At its further end, the arm 224 carries a third motor unit 226 with its output hub 14 again directed horizontally. The arm 224 also carries a short arm 225 similar to that shown in Figure 12, but formed with an opening for the passage of supply leads 218 so as to act in the same way as a cable cleat.

The output hub 14 of the third motor unit 226 carries a second arm 228 similar to the arm 224. This, in its turn, carries the fourth and final motor unit 230 which controls a grab arm unit as illustrated in Figure 5. As in Figure 5, the grab arms are shown as 96 and 98 and are opened and closed under the control

of the motor unit 230, the position of which in space is controlled by the three other motor units.

The motor units themselves are controlled quite independently as already described by means of the rocker switches 216 and produce a slow controlled turning movement which is what is required for robot operation. The toy as a whole is assembled merely by connecting together the various components already described as a result of a simple push-fitting operation which can be accomplished quite simply and rapidly by even a young child. The toy can then be dismantled equally simply by a reverse operation.

Figure 15 shows a stylised toy animal and is included to illustrate the versatility of a construction kit in accordance with the invention. Although not strictly a robot, the movements carried out are of the robotic type and four motor units in accordance with the invention are included for this purpose. The animal has a body 240 made up of two connecting arms joined together. At the rear, the body is connected to the first motor unit 242 which drives a wheel 244. At the other side a connecting arm 245 carries an idler wheel 246. At the front end of the body 240 a second motor unit 248 has its output directed downwardly to control the steering of a pair of wheels 249. The output hub is connected to an arm 250 as shown in Figure 11 which in its

turn is connected to a T-piece 251 as illustrated in Figure 12 which supports axles for the two wheels. A third motor unit 254 is mounted rigidly above the unit 248 and its output hub extends horizontally to control angular movements of an arm 255 of the kind illustrated in Figure 8 and constituting the neck of the animal. Finally, the fourth motor unit which can only partly be seen at 256, is connected to the forward end of the arm 255 and controls movements of upper and lower jaw members 257 and 258 respectively which, between them, constitute the complete head of the animal. Although details cannot be seen, the two jaws are controlled in exactly the same manner as the grab arm pair of Figure 6. The four motor units are controlled in the manner already described so as to provide backwards and forwards movement, steering, raising and lowering of the neck and opening and closing of the jaws.

The only one of the components described which is "dedicated", i.e. specific to this particular toy is the pair of jaws 257 and 258 and even these can be used in the assembly of other types of animal. All the other components, consisting mainly of motor units and connecting arms, can be used in the assembly of a wide variety of toys and models which can be both assembled and dismantled extremely quickly and simply but which, once assembled, are firmly connected together.

C L A I M S

1. A low speed motor unit for a toy or model comprising a motor and speed reduction gearing enclosed within a housing and permanently connected to a driving part projecting from the housing, the unit including at least two identical or mutually compatible male/female connectors, one of which is on the housing and one on the driving part.

2. A motor unit according to claim 1 in which both connectors are of the polygonal or square type.

3. A motor unit according to claim 1 or claim 2 in which there is at least one male and one female connector on the housing.

4. A motor unit according to any one of the preceding claims in which the driving part is a hub on which one of the connectors is provided.

5. A motor unit according to claim 5 in which the hub is shaped to form the connector.

6. A motor unit according to any one of claims 1 to 3 in which the driving part is an arm on which one of the connectors is provided.

7. A linear drive unit comprising a motor unit according to any one of the preceding claims having a toothed pinion connected to the driving part and meshing with a rack member capable of sliding movement in a guide connected to the housing,

8. Drawing apparatus for driving a writing instrument in mutually perpendicular X and Y directions in relation to a record surface and comprising a pair of linear drive units according to claim 7, having their rack members respectively parallel to the X and Y directions, that of the first linear drive unit being fixed so that the motor unit is driven along it, and this motor unit carrying the motor unit of the second linear drive unit so that the associated rack member is driven in the Y direction and carries at its end a mounting for a writing instrument.

9. A unit according to any one of claims 1 to 7 which provides for rotary or linear motion within the following speed ranges: for rotary or angular movement a speed of ninety degrees in one to thirty seconds inclusive and for linear or substantially linear motion a speed of from one tenth to four centimetres per second inclusive.

10. A toy or model constructed from a kit of parts and comprising at least two motor units which are independently controllable and connected so that actuation of one motor unit effects bodily movement of the other motor units or units.

11. A toy or model according to claim 10 and comprising at least one arm controlled by a motor unit and itself carrying at least one motor unit for the control of a further component or components of the toy or model.

12. A toy or model according to claim 10 or claim 11 in which each motor unit is a motor unit according to any one of claims 1 to 6, or a linear drive unit according to claim 7.

13. A toy or model according to any one of claims 10 to 12 and further including control means for independently operating each motor and means for transmitting control signals from the control means to allow independent operation of the motors by actuation of the control means.

14. A toy or model according to claim 13 wherein the control means are adapted to be manually operable and/or adapted to be operable by signals received from a computer or a micro-processor device.

15. A kit of parts for constructing toys or models according to any one of claims 10 to 14.

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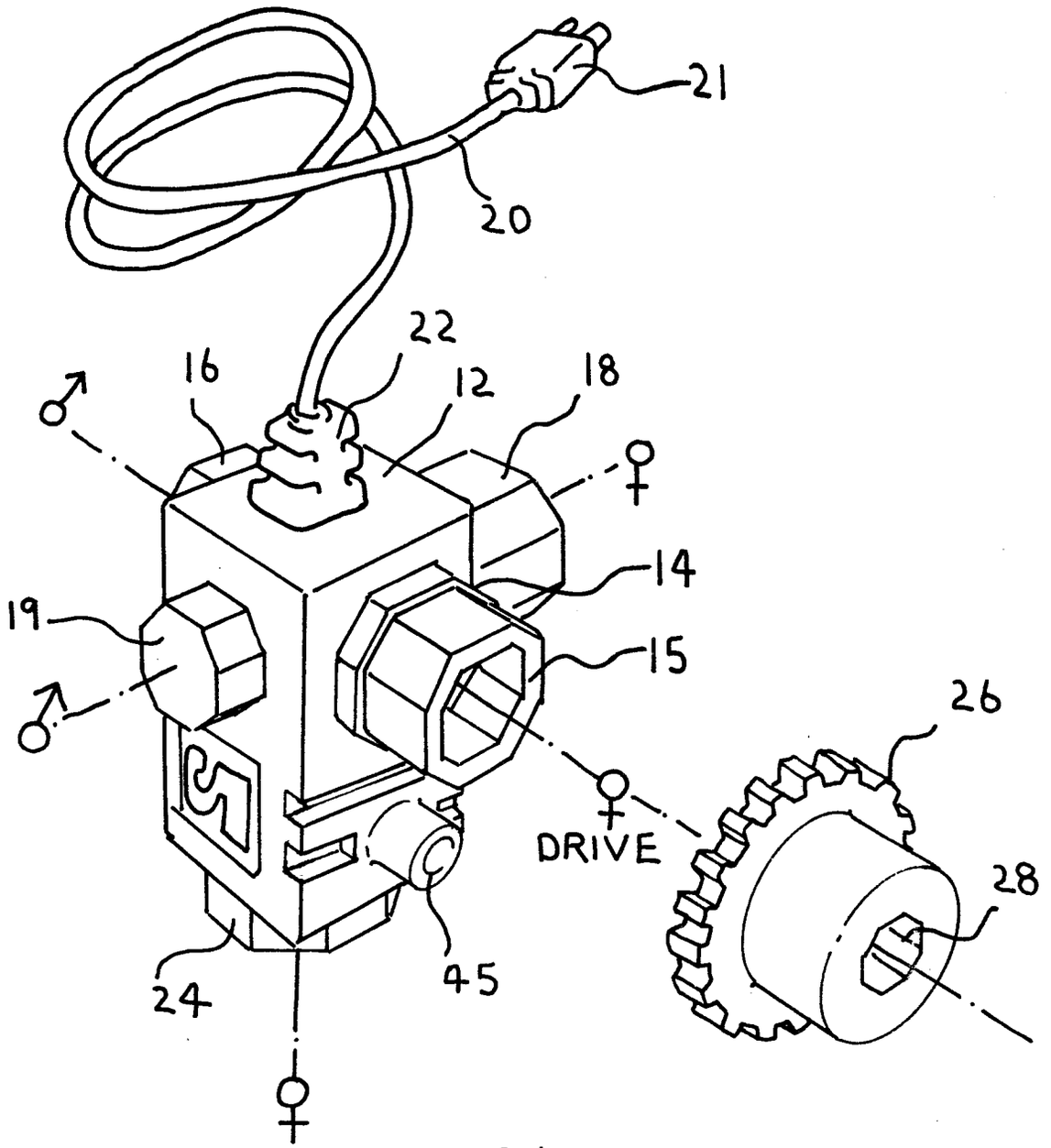

FIG. 1.

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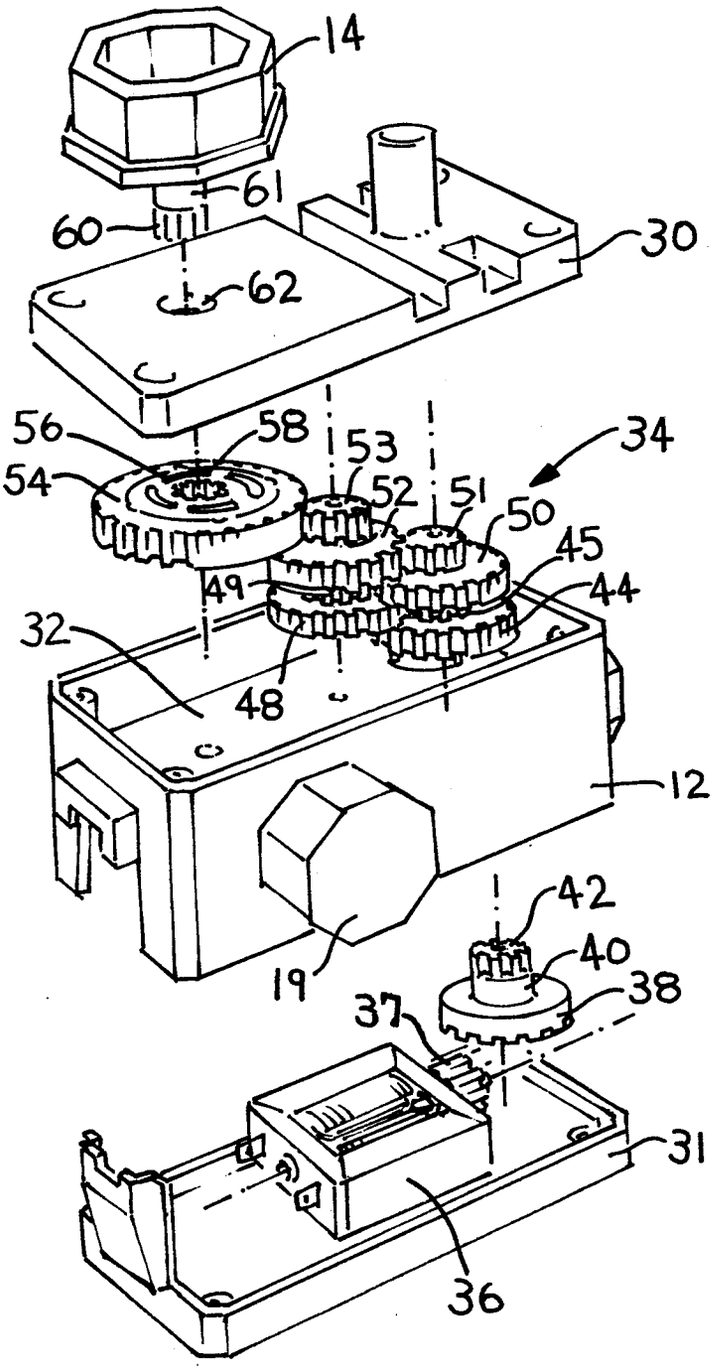

FIG.2.

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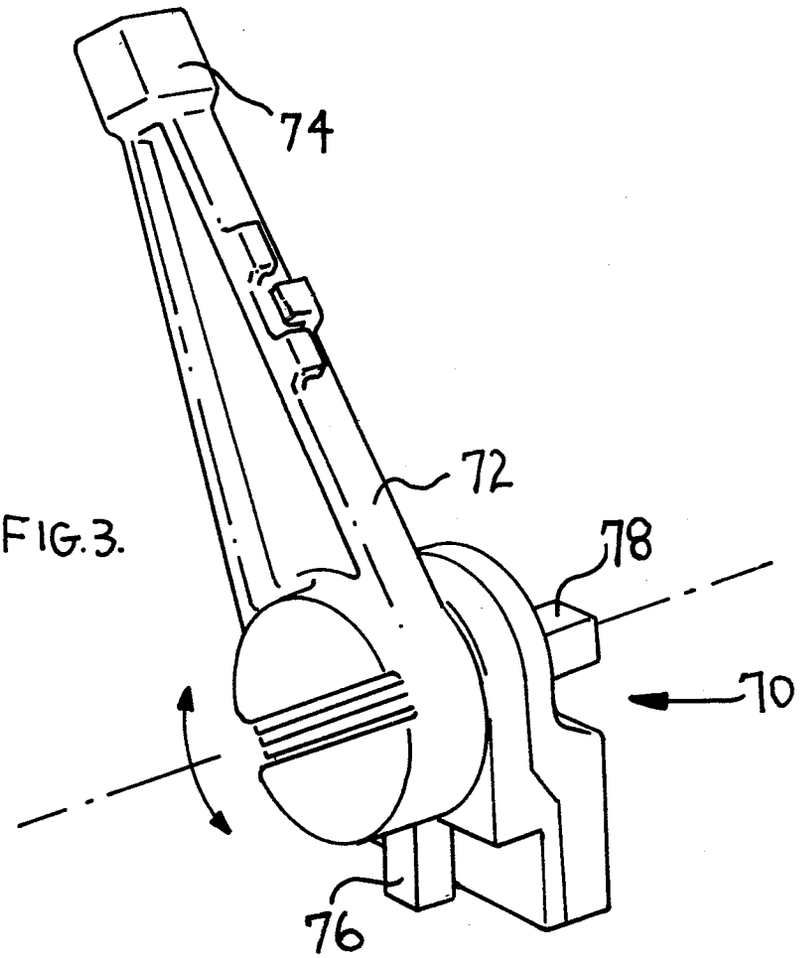

FIG. 3.

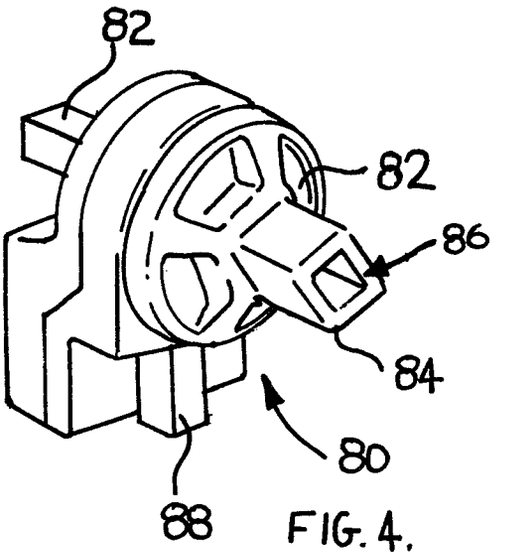

FIG. 4.

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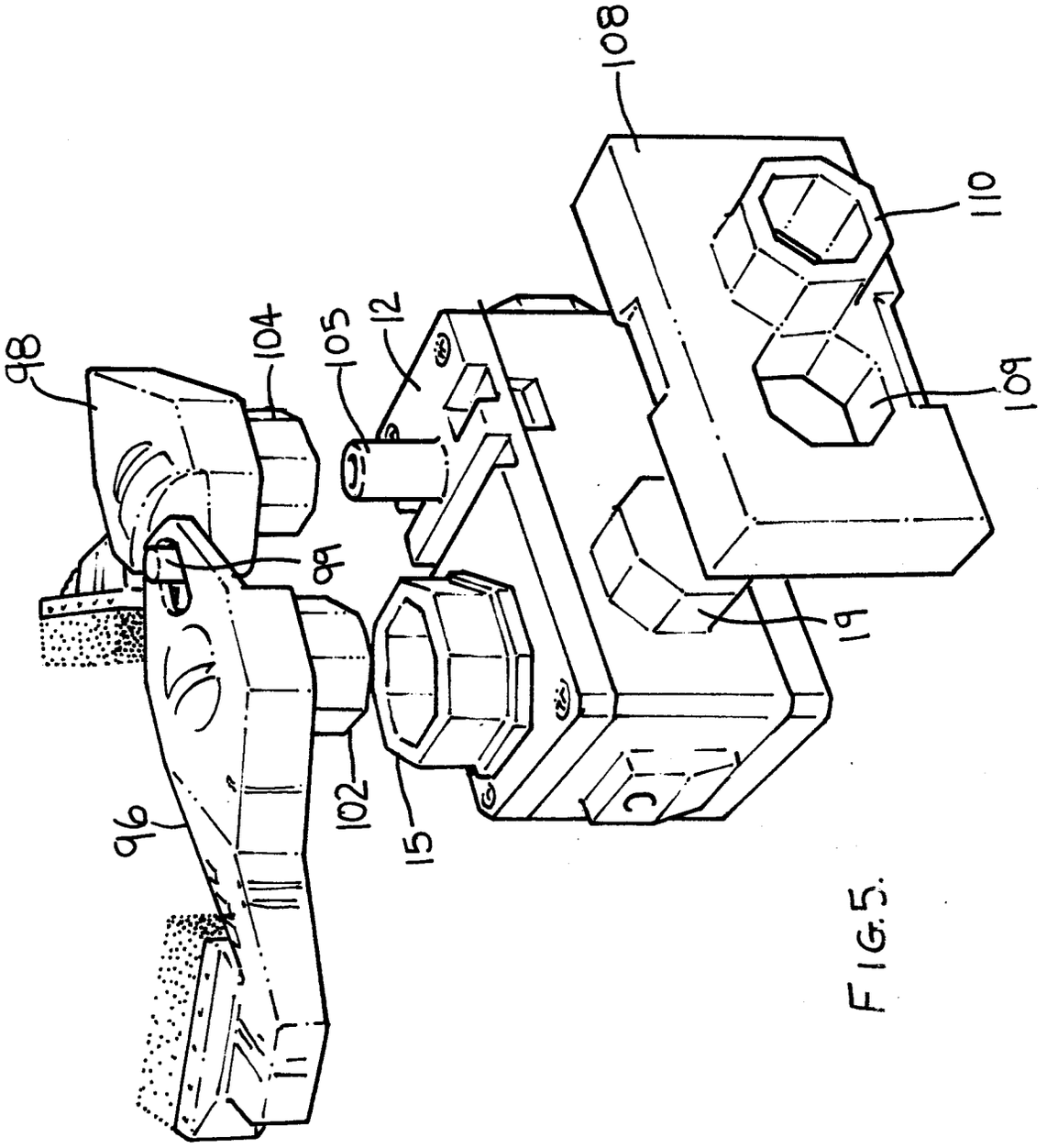

FIG.5.

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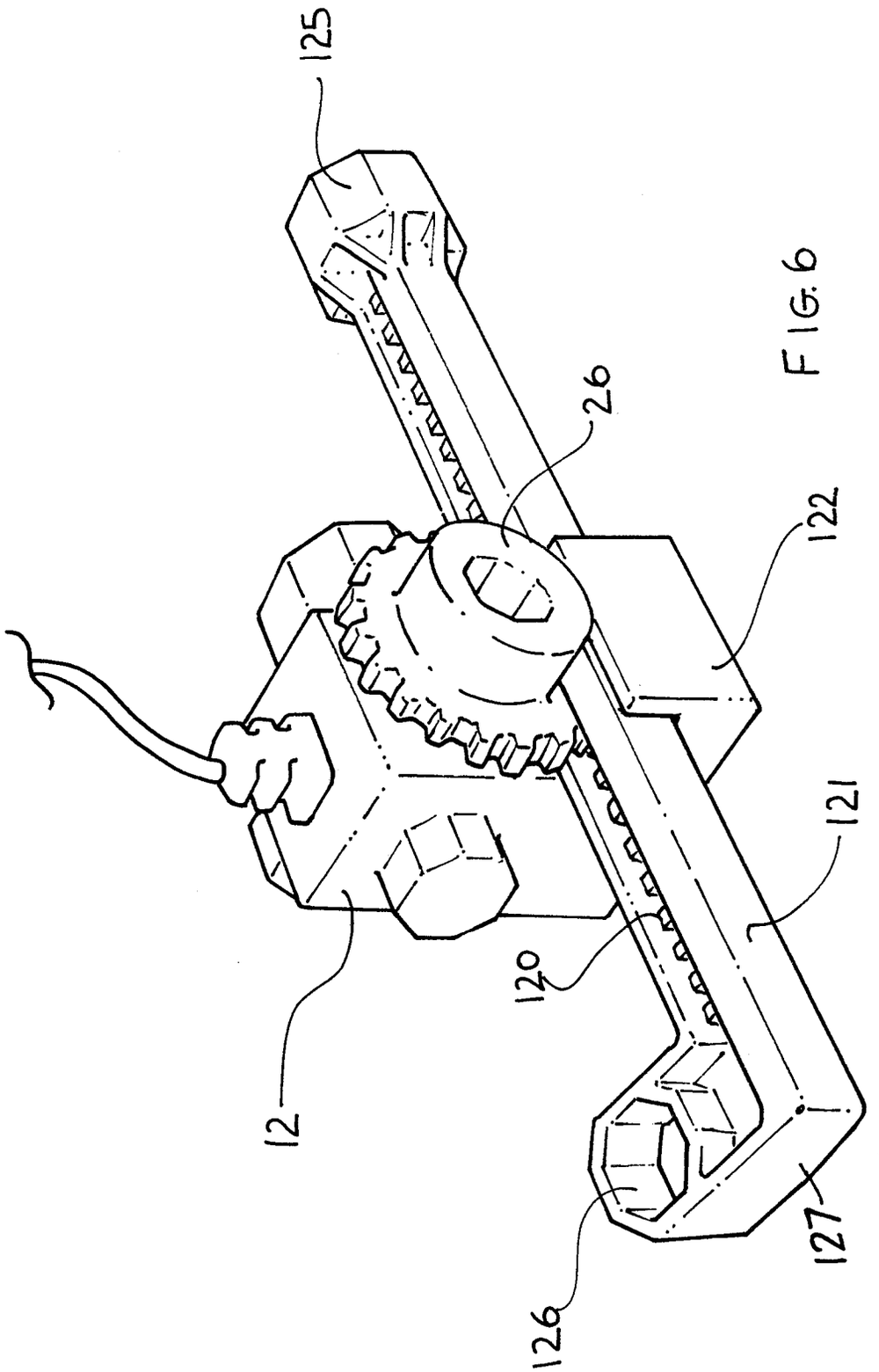

FIG.6

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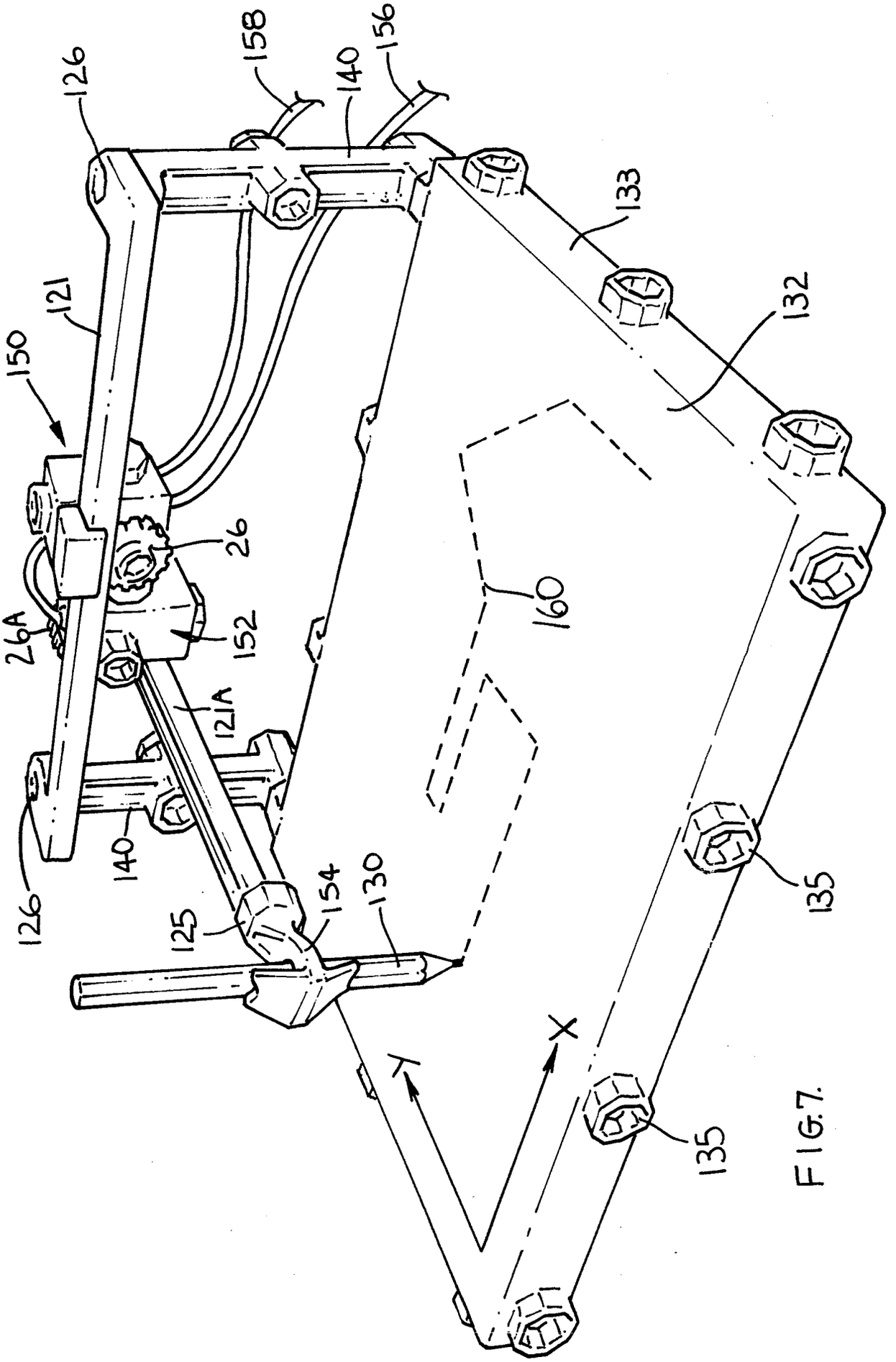

FIG.7.

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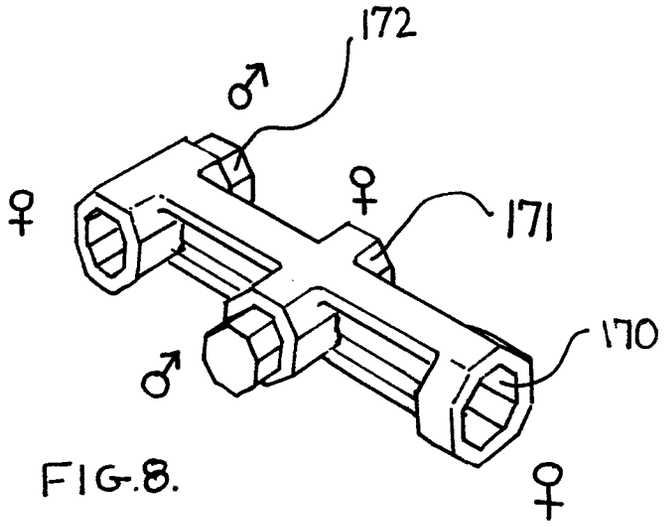

FIG.8.

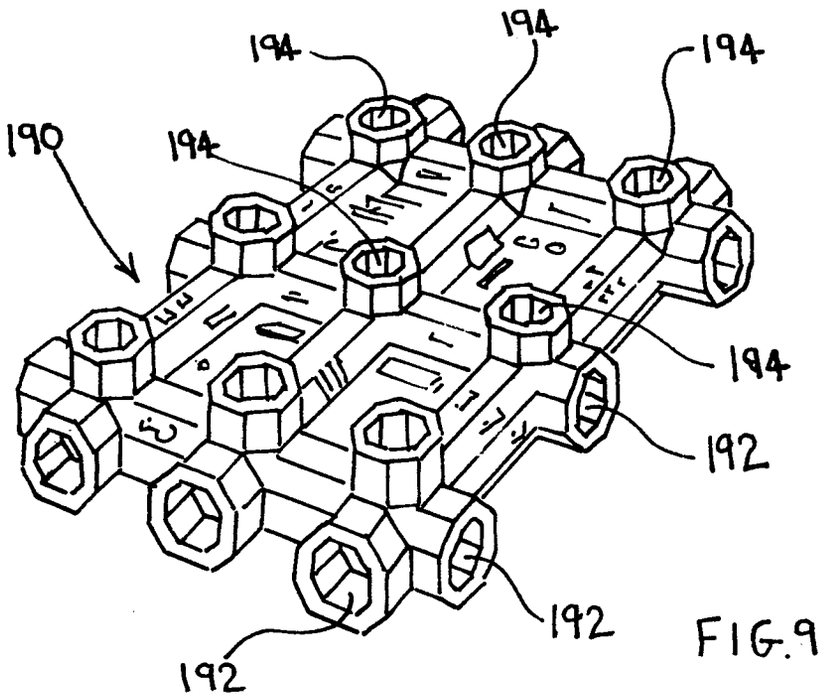

FIG.9.

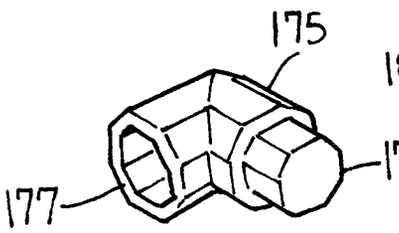

FIG.10.

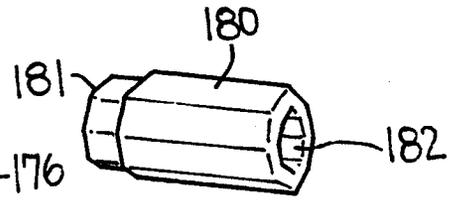

FIG.11.

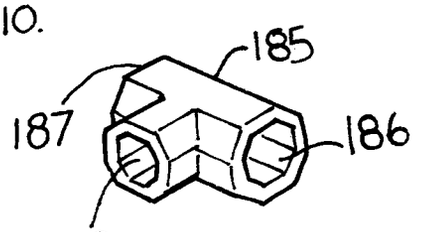

FIG.12.

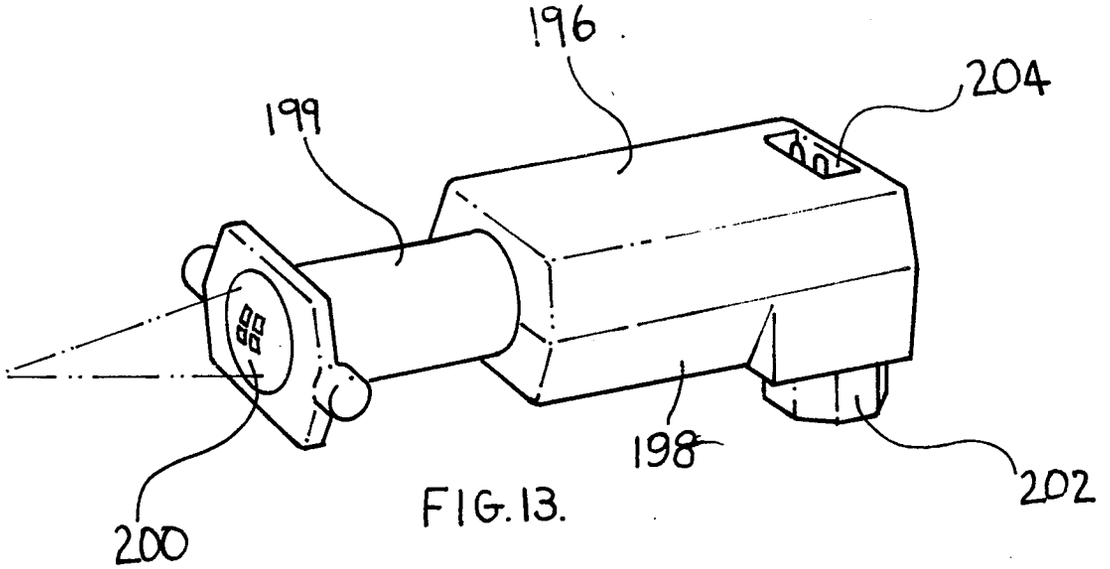

FIG.13.

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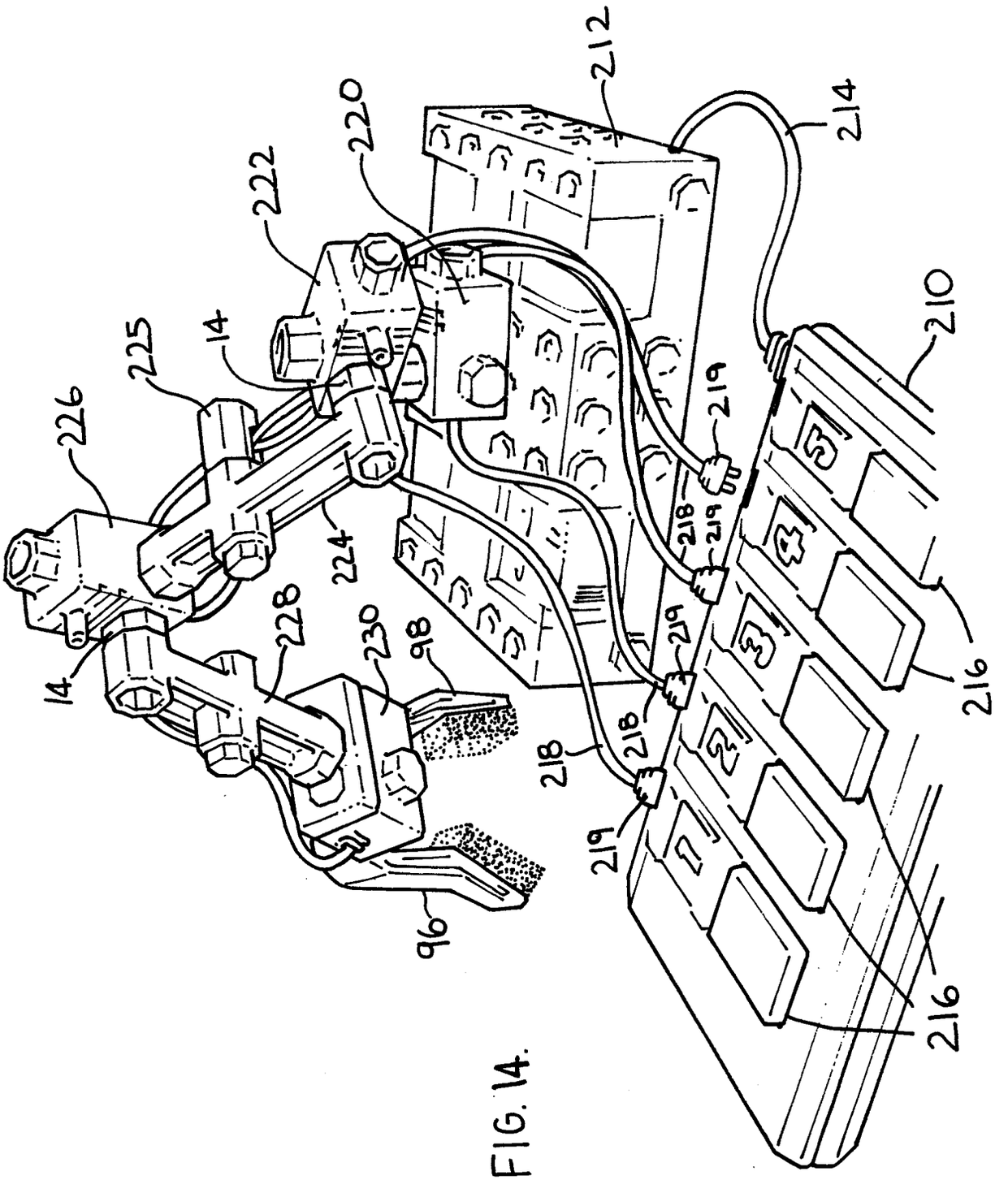

FIG. 14.

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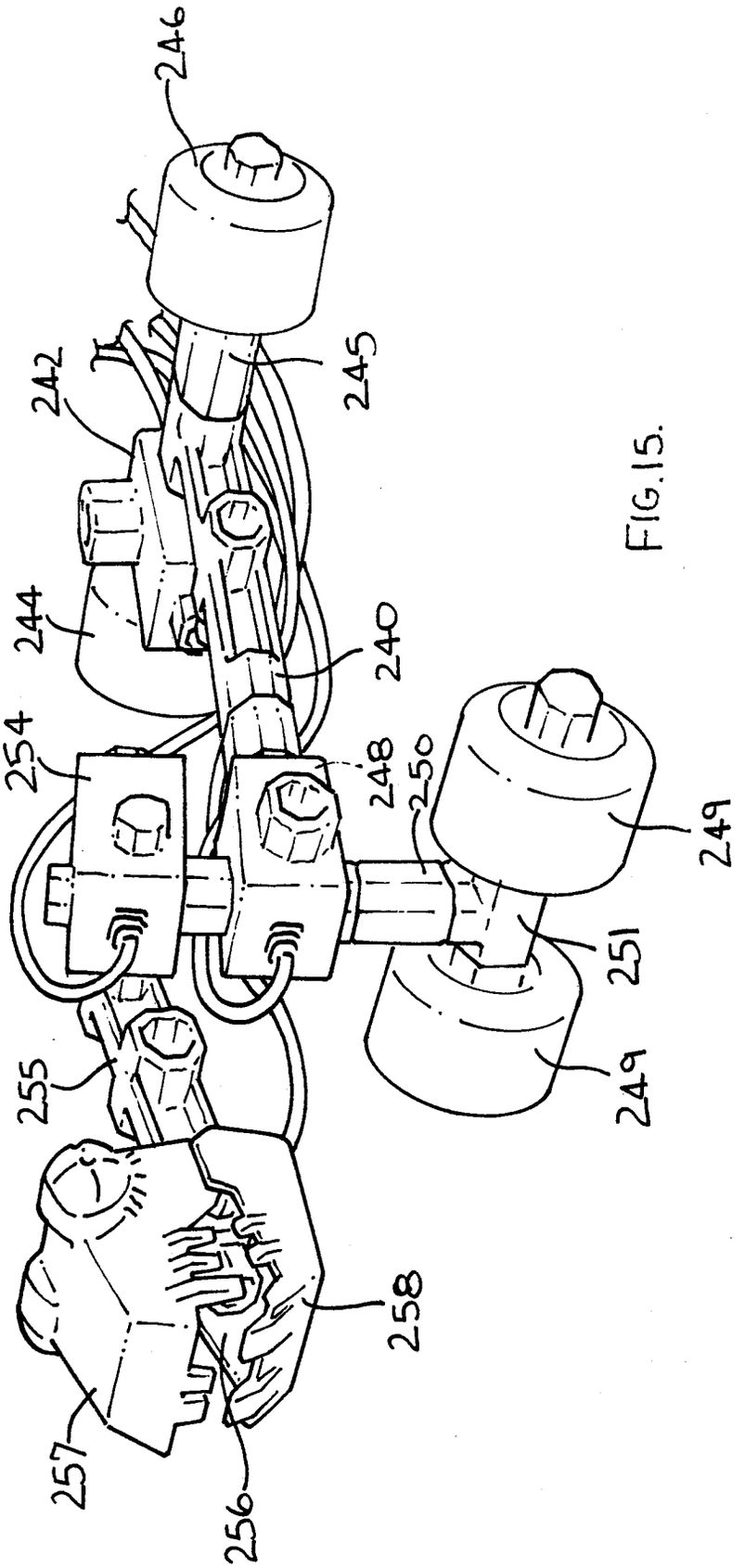

FIG.15.

European Patent Office

EUROPEAN SEARCH REPORT

0124237

EP 84 30 1929

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
			A 63 H 33/04
X	FR-A-2 321 733 (MITSUBISHI PENCIL CO. LTD.) * Claims 3-5; page 7, lines 28-33; page 9, lines 22-29; page 10, lines 2-4 *	1,2	
A	DE-A-2 746 692 (A. FISCHER) * Figure *	1	
A	GB-A-1 112 500 (A. FISCHER) * Claim 1 *	3	
A	DE-A-1 603 658 (FEINPOLIERTE BAUFIX-HOLZSPIELWAREN H. WAMMETSBERGER) * Claim 1; figure 2 *	3,4	
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
A	AT-B- 286 839 (H. HASEL) * Claims 1-3; page 2, lines 37-39 *	4	A 63 H 17/00 A 63 H 29/00 A 63 H 33/00
A	FR-A-2 117 009 (MATTEL INC.) * Page 4, lines 1-5; figure 3 *	7,8,14	
A	US-A-3 572 703 (H.T. GREENE) * Column 2, lines 12-22; figure 1 *	7,8,10,11,13,14	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	19-06-1984	CLOT P.F.J.

CATEGORY OF CITED DOCUMENTS

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