(12) UK Patent Application (19) GB (11) 2 375 988 (13) A

(43) Date of A Publication 04.12.2002

(21) Application No 0110865.3

(22) Date of Filing 03.05.2001

(71) Applicant(s)
Peter David Hurley
42 Talbot Street, RUGELEY, Staffs, WS15 2EG, United Kingdom

(72) Inventor(s)
Peter David Hurley

(74) Agent and/or Address for Service
Peter David Hurley
42 Talbot Street, RUGELEY, Staffs, WS15 2EG, United Kingdom

(51) INT CL[7]
B29C 67/00

(52) UK CL (Edition T)
B5A AD23 ATXP AT3P A1R314C3 A1R448 A2A4X A2D1X A20TX A20T3 A20T9

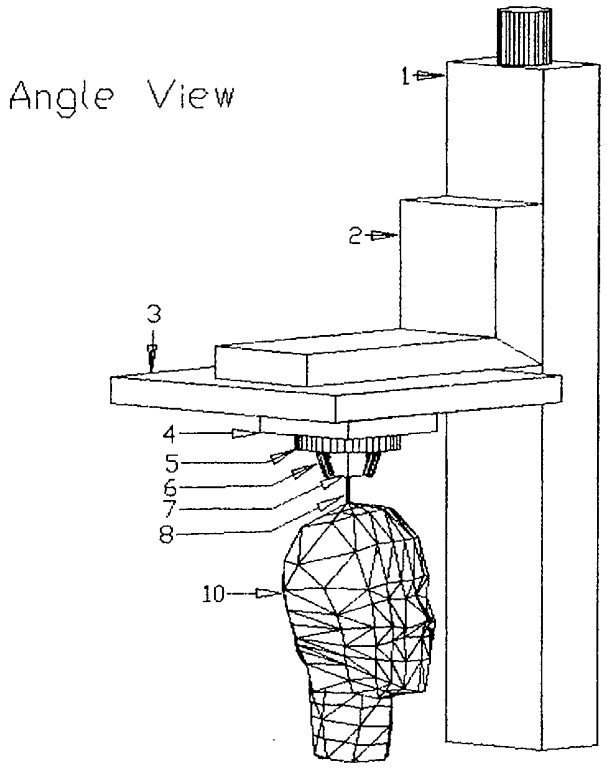
(56) Documents Cited
GB 2233928 A
DE 004112695 A
US 5204124 A
EP 0686480 A2
US 6133336 A
US 4999143 A

(58) Field of Search
UK CL (Edition T) **B5A** AA2 AD23 AF39C ATXP AT3P
INT CL[7] **B29C** 67/00
Online: WPI EPODOC JAPIO

(54) Abstract Title
3-D Bust maker

(57) A three dimensional bust maker which reproduces the human head in a three dimensional form, by way of laying layers of a light curing polymer down, one on top of the other. The device receives surface data of the human head and transforms this data into layers, these layers being the circumference measurements of the head at the given height increments through out the full height of the head. The device is computer controlled in its operation and produces the bust model 10, by directing the dispensing nozzle 8 to the start build position 5/8 Fig. 1 then dispensing the light curing polymer as the carriage 4 is manoeuvred around the stator 3 with the light beams 11 curing the polymer as it goes 9, building layers one on top of each other until the full model is produced 5/8 Fig. 2, 3 and 4, 6/8 Fig. 1 to 4.

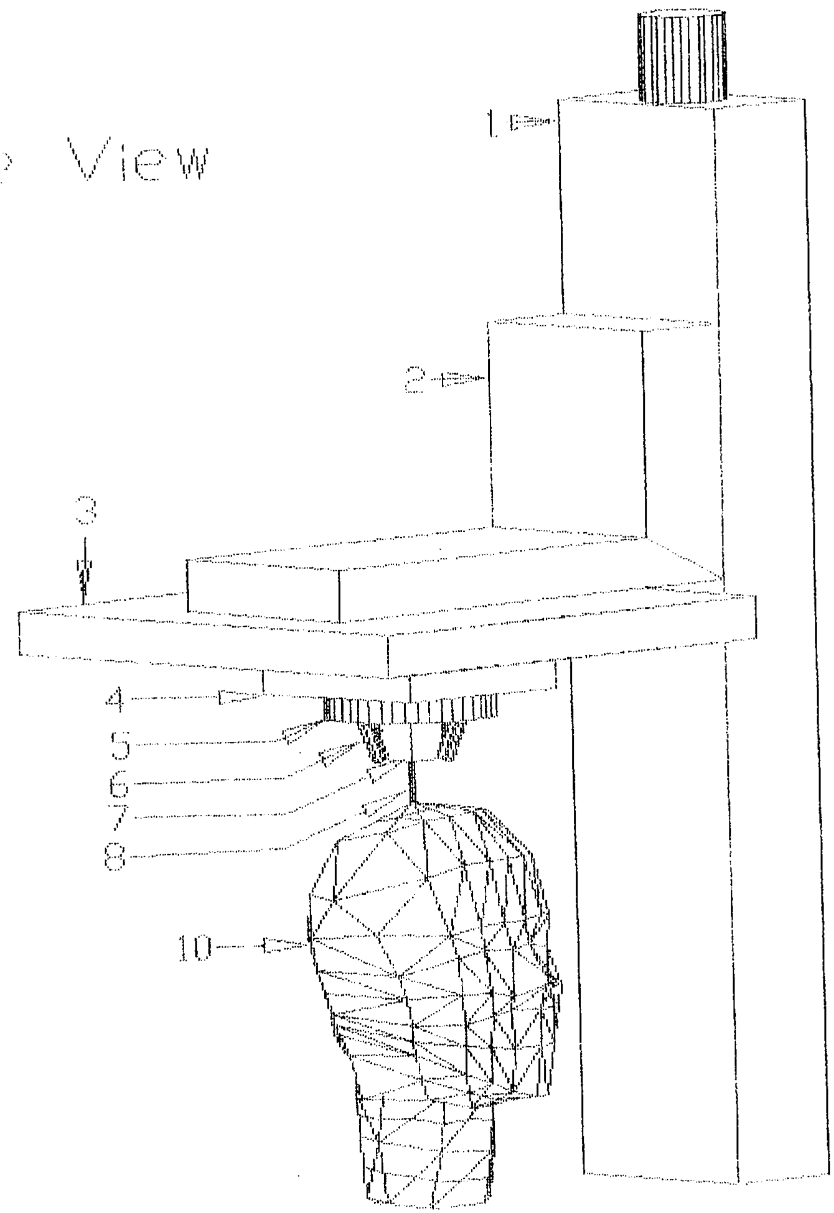
The light curing polymer in liquid form is delivered to a dispensing control valve 7 which controls flow of the fluid to the nozzle 8.



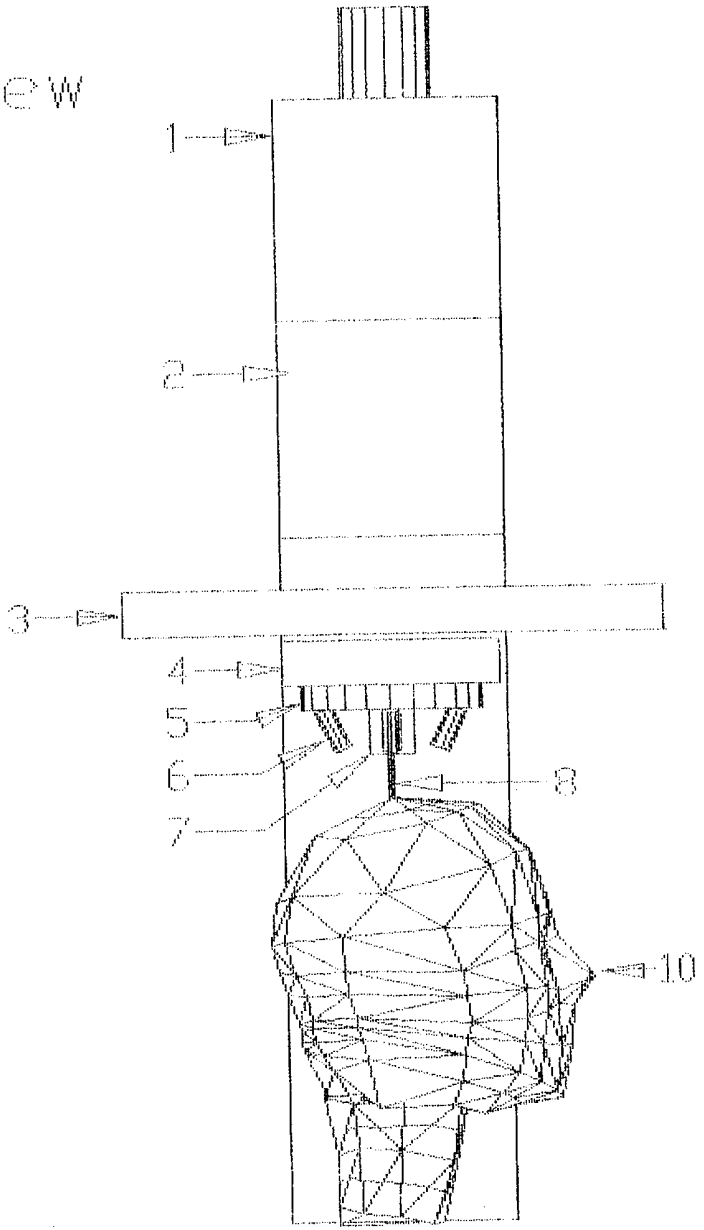
GB 2 375 988 A

The claims were filed later than the filing date but within the period prescribed by Rule 25(1) of the Patents Rules 1995.

Angle View

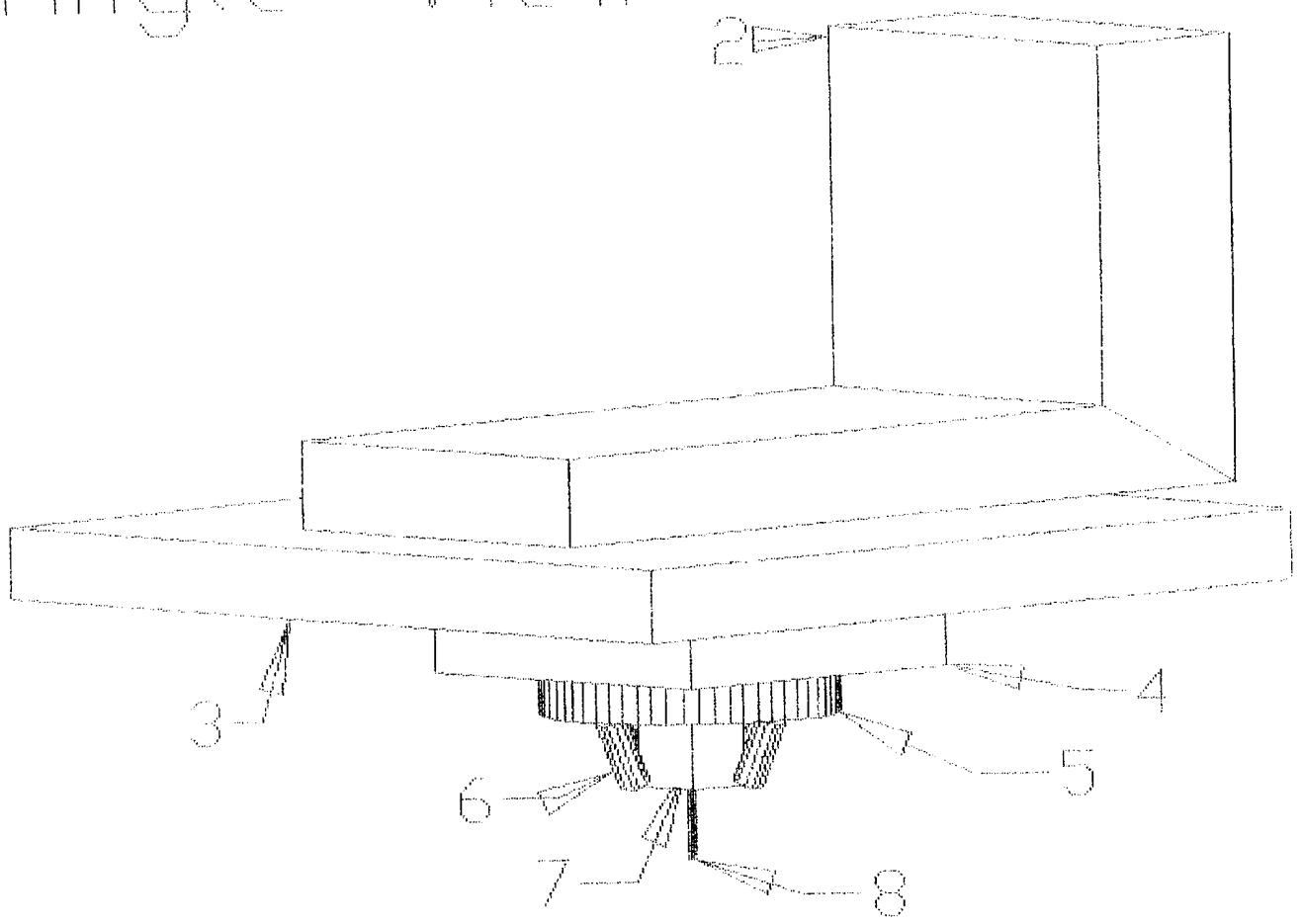


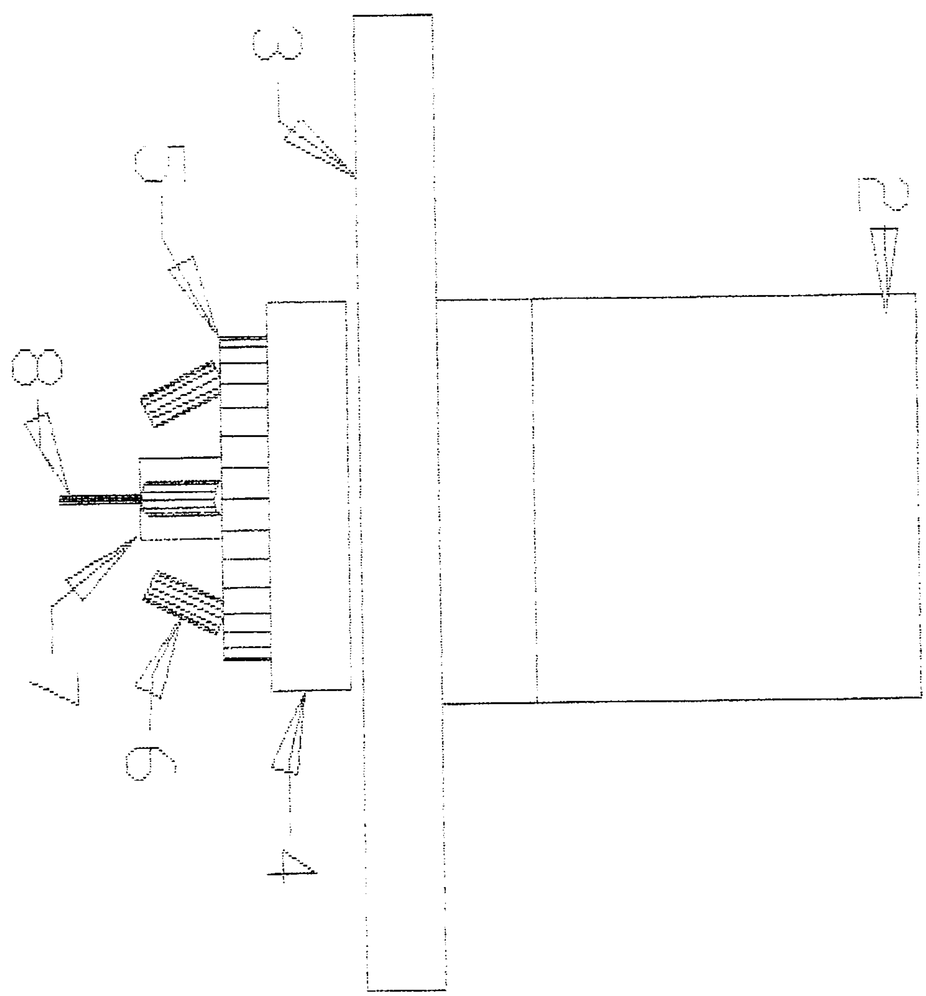
Front View



a/8

Angle View





Front View

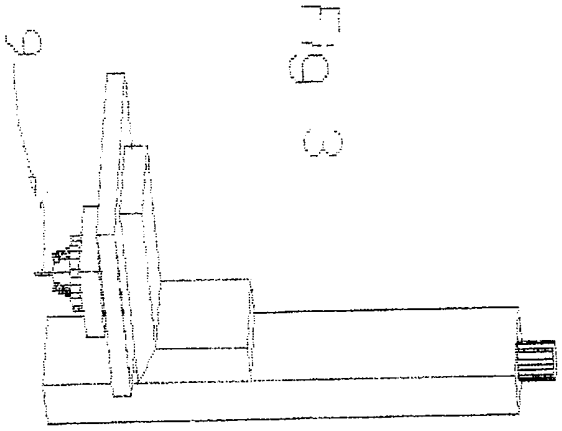


Fig 3

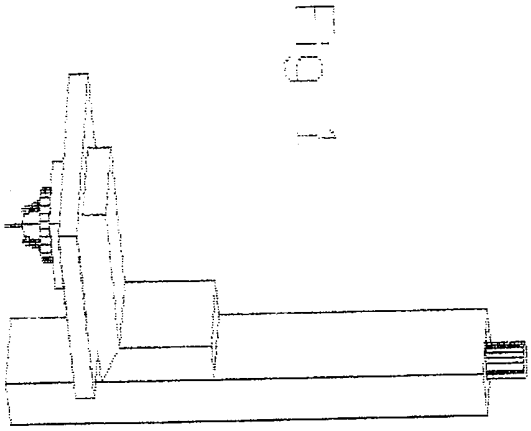


Fig 1

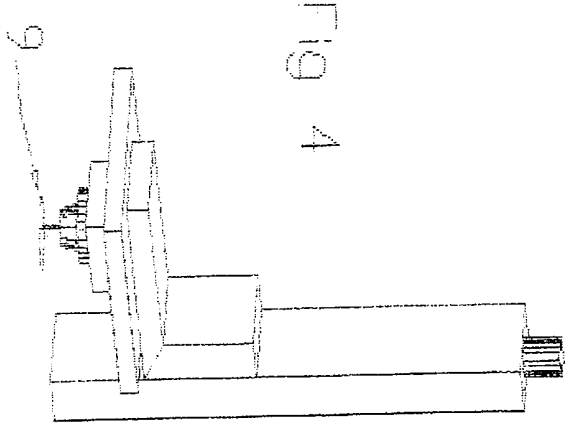


Fig 4

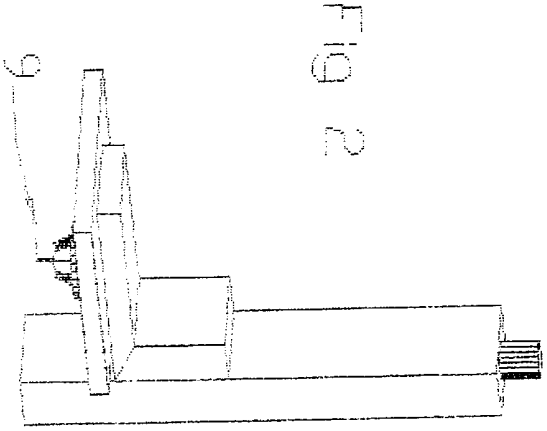


Fig 2

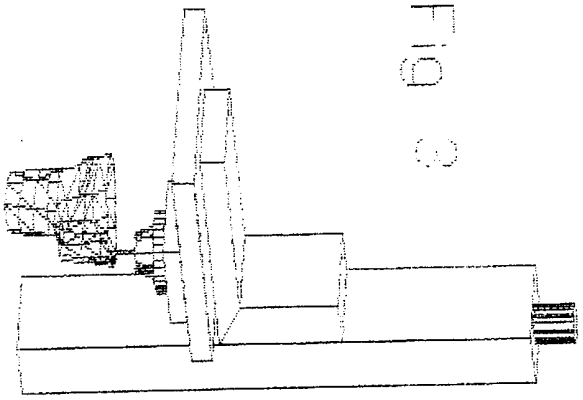


FIG 3

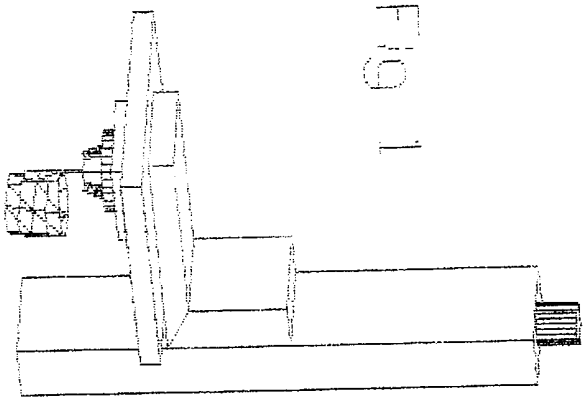


FIG 1

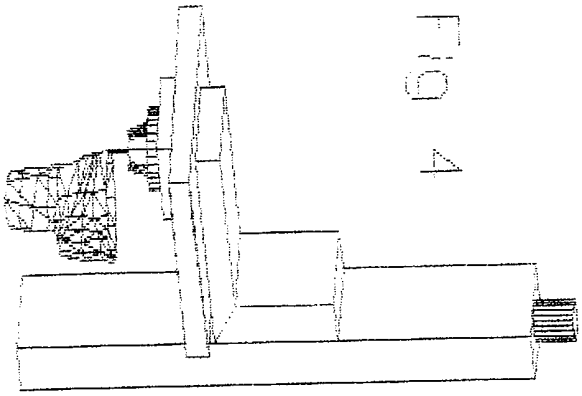


FIG 4

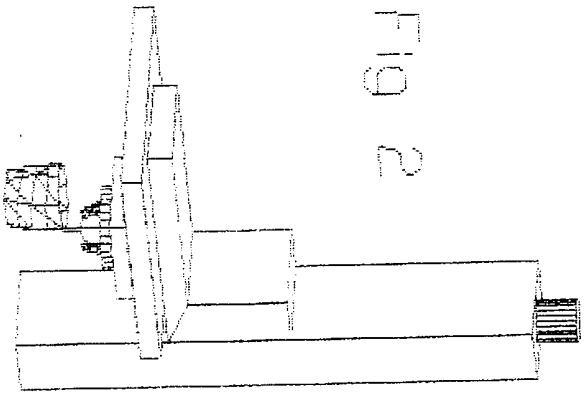


FIG 2

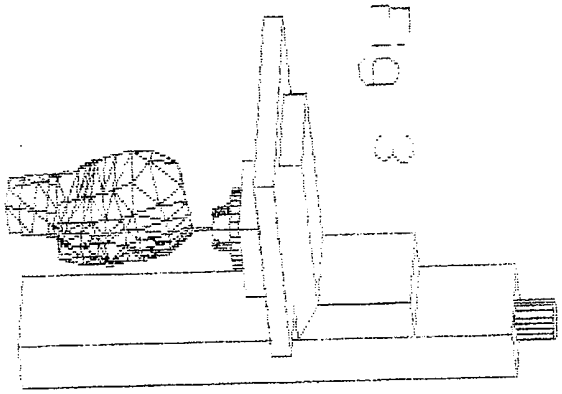


Fig 3

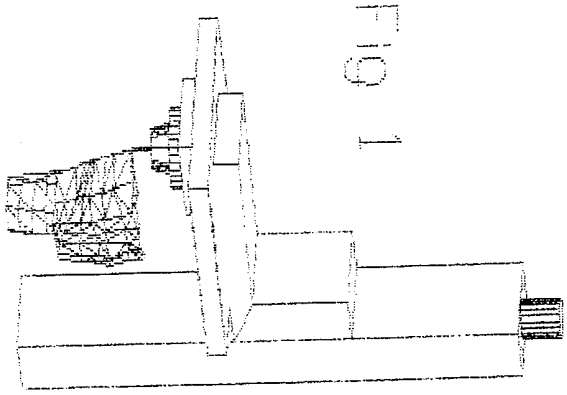


Fig 1

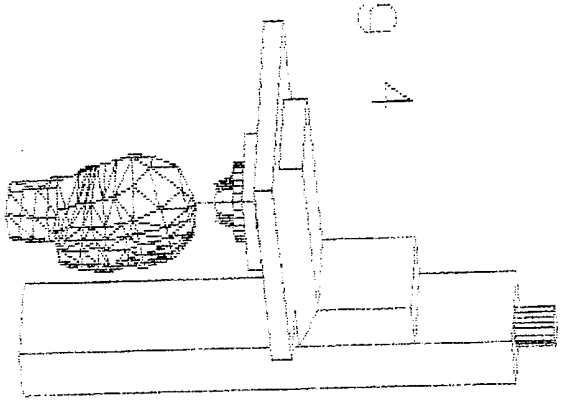


Fig 4

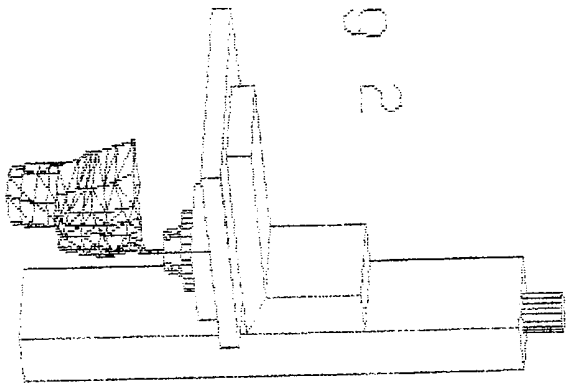
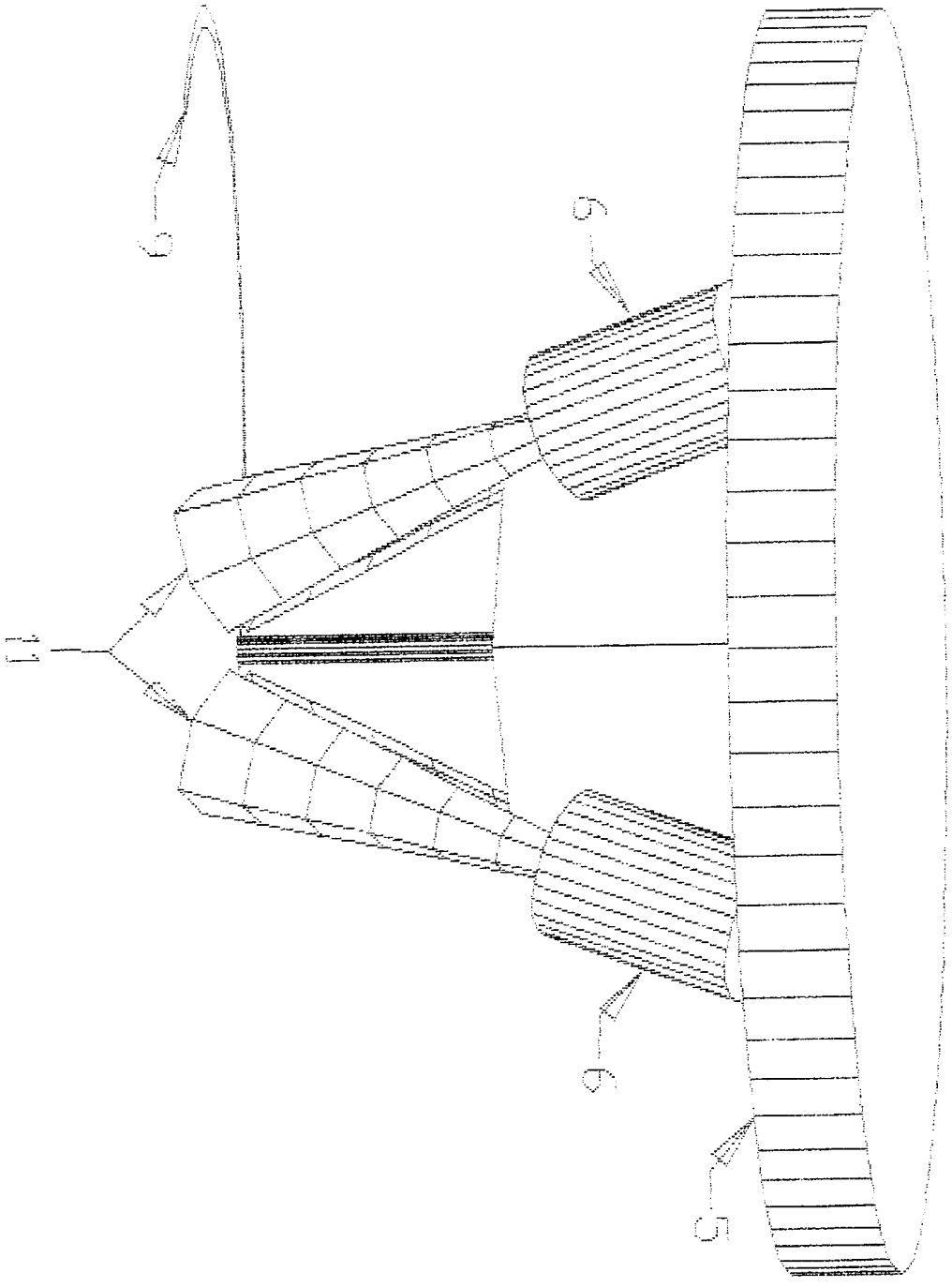


Fig 2


5
5
5
5
5

3-D Bust Maker

This invention relates to the production of a bust in a three dimensional form, by use of computers, electro/magnetic means, electro/mechanical means, computer numeric control, computer pneumatic control, and light curing polymers.

This invention address' the problem of the time it takes to produce a bust with conventional equipment and will enable a greater quantity of bust's to be produced than can currently be done in a given time, also it will reduce the amount of material required to produce a bust.

The objective of this invention is to use three dimensional information of the surface of the human head and reproduce the human head in a three dimensional form, in a much faster rate than can currently be produced, with minimising the material required to reproduce the bust.

Accordingly, this device provides a means by which a bust can be produced in a three dimensional form, by way of laying layers of a light curing polymer down, one on top of each other, to build up the complete model. The use of a light curing polymer enables the control of the dispensing at high speeds. The first layer begins at the bottom of the model, where the device dispenses a continuous bead of polymer following the circumference around the bottom of the model in two dimensions, as the light curing polymer is dispensed in a liquid state, the polymer is solidified by way of projecting light beams on to the polymer bead. The use of electro/magnetic means to control the positioning of the dispensing in the two dimensions greatly improves the speed of application. The device then elevates in the upward direction adding the third dimension and dispenses another layer on top of the first layer, following the circumference of the model at that given height, with the second layer adhering to the first layer, this process continues until a complete model is formed, with only the outside form of the bust being produced this reduces the material required to manufacture the bust.

The devices computer receives data of the 3-D surface of the human head by way of file transfer, this computer with its software then transforms the data to suit this application by distinguishing each layer at a given height of the model, this transformed data is then used by way of machine code to control the movements of the component parts of this device.
The movement in both lateral direction of the dispensing nozzle is provided by a sliding carriage which floats around a fixed stator using an electrically generated magnetic field and the existing magnetic field provided in the carriage, the positioning of the carriage is controlled by the devices computer from the circumference data at the height data of each layer.
The height position of the carriage and stator relative to the model is provided by the vertical motion provider which is electro/mechanical in function and controlled by the devices computer from the height data of each layer.
The light curing polymer is delivered to the dispensing control valve and passed onto the dispensing nozzle by means of pneumatic control governed by the devices computer.
The light curing polymer is solidified by projecting light beams onto the dispensed fluid and controlled by the devices computer.

A preferred embodiment of the invention will now be described with reference to the accompanying drawings in which:

Drawing 1/8 Angle View: Shows a angle view of the device.

Drawing 2/8 Front View: Shows a front elevation view of the device.

Drawing 3/8 Angle View: Shows a angle view close up of the attachment bracket, the stator, the carriage, the light source attachment bracket, the light source, the dispensing control valve, the dispensing nozzle.

Drawing 4/8 Front View: Shows a front view close up of the attachment bracket, the stator, the carriage, the light source attachment bracket, the light source, the dispensing control valve, the dispensing nozzle.

Drawing 5/8 Figure 1: Shows the device at the start build position of the operation.

Drawing 5/8 Figure 2: Shows the device at part way around laying of the first layer with a bead of polymer trailing from the start build position.

Drawing 5/8 Figure 3: Shows the device approximately half way around the first layer.

Drawing 5/8 Figure 4: Shows the device approximately three quarters the way around the first layer.

Drawing 6/8 Figure 1: Shows the device having completed a number of layers at the back of the neck.

Drawing 6/8 Figure 2: Shows the device at the top and the front of the neck.

Drawing 6/8 Figure 3: Shows the device having completed further layers at the front of the head.

Drawing 6/8 Figure 4: Shows the device at the rear of the head.

Drawing 7/8 Figure 1: Shows the device having completed further layers at the rear of the head.

Drawing 7/8 Figure 2: Shows the device at the front of the head.

Drawing 7/8 Figure 3: Shows the device having completed further layers at the front of the head.

Drawing 7/8 Figure 4: Shows the device at the finish build position having completed the model.

Drawing 8/8: Shows a close up of the light source attachment bracket, the light sources, the dispensing control valve, the dispensing nozzle, the light beams and the trial of solidified polymer behind the dispensing nozzle.

With reference to drawings 1/8 through to 8/8, the vertical motion of the device is provided by item 1, which is a linear slide and provides vertical motion by way of electro/mechanical means. Attachment bracket 2 provides attachment from the vertical motion provider 1 to the stator 3, item 2 is fixed to both 1 & 3, therefore if the attachment bracket 2 is elevated in the vertical direction or descends in the downward direction by the vertical motion provider 1, the stator 3 elevates and descends with the attachment bracket 2.

The lateral motion of the device is provided by the carriage 4, which can move in two directions both backwards and forwards, together with from side to side independently from the vertical motion, this motion is achieved by electro/magnetic forces which enables the carriage 4 to float below the stator 3 ref; drawing 4/8, with the vertical provider 1 being connected to the stator 3 and the carriage 4 floating below the stator 3, therefore if the stator 3 is raised the carriage 4 is raised with it, the positioning of the carriage 4 below the stator 3 is controlled by the devices computer.

Attached to the carriage 4 is the light source attachment bracket 5, which supports the light sources 6, these are inclined towards the bottom of the dispensing nozzle 8 to project the light beams 11 ref; 8/8 onto the light curing polymer as the liquid polymer is omitted from the nozzle 8, also the dispensing control valve 7 is attached to the carriage 4, attached to the dispensing control valve 7 is the dispensing nozzle 8, these components are all fixed together and therefore the movement of carriage 4 will in turn move together the light source attachment bracket 5, the light sources 6, the dispensing control valve 7 and the dispensing nozzle 8.

The light curing polymer in liquid form is delivered to the dispensing control valve 7, which controls the flow of the fluid through to the dispensing nozzle 8 via the devices computer, as the light curing polymer is dispensed out of the dispensing nozzle 8 the light beams 11 generated by the light sources 6 solidifies the light curing polymer into a solid bead 9 ref; 8/8.

The process of producing the bust starts with rearranging the data of the surface of the human head which has previously been obtained, this rearrangement takes the form of producing the circumference data at a given height of the head, this circumference data is the outside surface measurement of the human head at a given height of the head, the circumference data is then produced for the full height of the head at given height increments through the entire height of the head, this data is then formulated into a computer numeric control programme.

The computer numeric control programme (CNC part programme) is then used to control the device in the production of the bust, the device positions the nozzle 8 at the start build position of the model 10, ref; 5/8 fig.1, the dispensing control valve 7 allows the light curing polymer to flow through to the dispensing nozzle 8 and subsequently out of the nozzle 8, where the light beams 11 solidify the light curing polymer into a solid bead 9, the carriage 4 is moved around the stator 3 following the circumference data of the model, given by the devices computer for that particular layer, where a continuous bead of polymer 9 is laid behind the nozzle 8, when the carriage has returned to the start position of that layer, the stator 3 is lifted by the vertical motion provider 1 to the next layer height, the process is then repeated with the new layer of polymer adhering to the previously laid layer, ref; 6/8 fig.1 to 4 and 7/8 fig.1,2 & 3, this continues for each layer until the full height of the model 10 is produced, ref; 7/8 fig 4.

Claims

1. A method of manufacturing a three dimensional bust, comprising of dispensing a light curing polymer in liquid form, solidifying the polymer with light, building layers of the cured polymer one on top of each other, to produce a three dimensional bust.

2. A method according to claim 1, the use of electro/magnetic means to control the positioning of the dispensing of the light curing polymer in two dimensions, to produce a three dimensional bust.

3. A method of manufacturing a three dimensional bust substantially as described herein with reference to Drawings 1/8, 2/8, 3/8, 4/8, 5/8 Fig 1-4, 6/8 Fig 1-4, 7/8 Fig 1-4, 8/8.

Application No: GB 0110865.3
Claims searched: 1-3

Examiner: Monty Siddique
Date of search: 27 September 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): B5A (AA2, AD23, AF39C, AT3P, ATXP)

Int Cl (Ed.7): B29C 67/00

Other: Online: WPI EPODOC JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
Y	GB 2233928 A	(BROTHER) see abstract; dispensing photo-curable resin to form a layered 3-D article	1-3
Y	EP 0686480 A2	(3D SYSTEMS INC.) see abstract as highlighted; CAD technique for layering photosensitive liquid resins to manufacture sculpture models	1-3
Y	DE 004112695 A	(EOS ELECTRO OPTICAL) see abstract; stereolithographic technique to manufacture 3-D models using light sensitive resins	1-3
Y	US 6133336	(ZENECA) see abstract provided; layering of light activated resins to form models of animal parts	1-3
Y	US 5204124	(BAYLESS EARL) see abstract; dispensing photosensitive liquid resin layer-by-layer to form articles	1-3
Y	US 4999143	(3D SYSTEMS) see abstract; producing 3-D objects by stereolithography using photo curable liquid resins	1-3

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family
A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.