United States Patent

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[45] Patented Oct. 27, 1970

[73] Assignee Said Reynolds and said Balla assignors to IIT Research Institute, a corporation of Illinois

[54] METHOD FOR AUTOMATICALLY CUTTING HAIR

3 Claims, 13 Drawing Figs.

[52] U.S. Cl. 132/7

[51] Int. Cl. A45d 44/00

[50] Field of Search 132/7, 45

[56] References Cited

UNITED STATES PATENTS

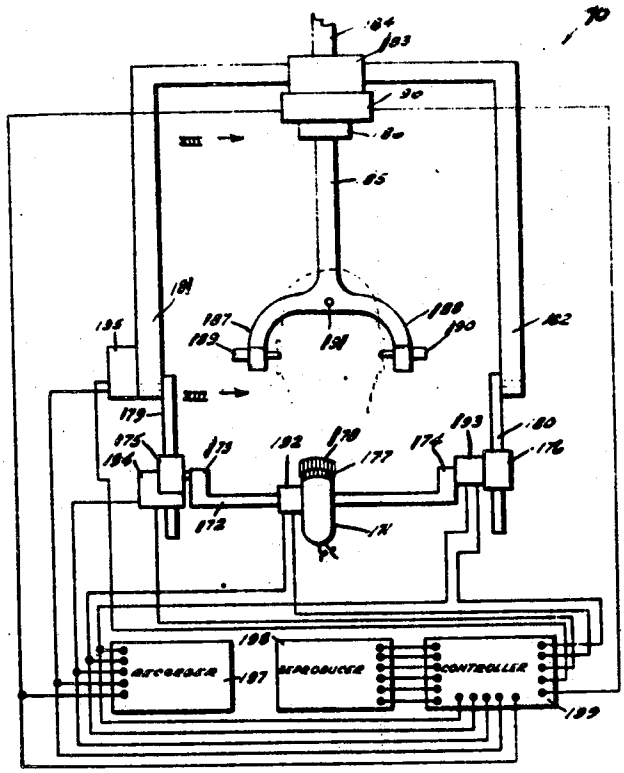
3,241,562 3/1966 Gronier 132/45

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ABSTRACT: A method of automatically cutting hair by determining and recording certain general information concerning the shape and size of the head of the person whose hair is to be cut, recording specific information concerning various hair styles, providing an automatic hair cutting machine receptive to such general and specific information for cutting hair in accordance therewith, selecting said specific information relating to one of said various hair styles and feeding both the general information and the selected specific information into said hair cutting machine to control the operation thereof.



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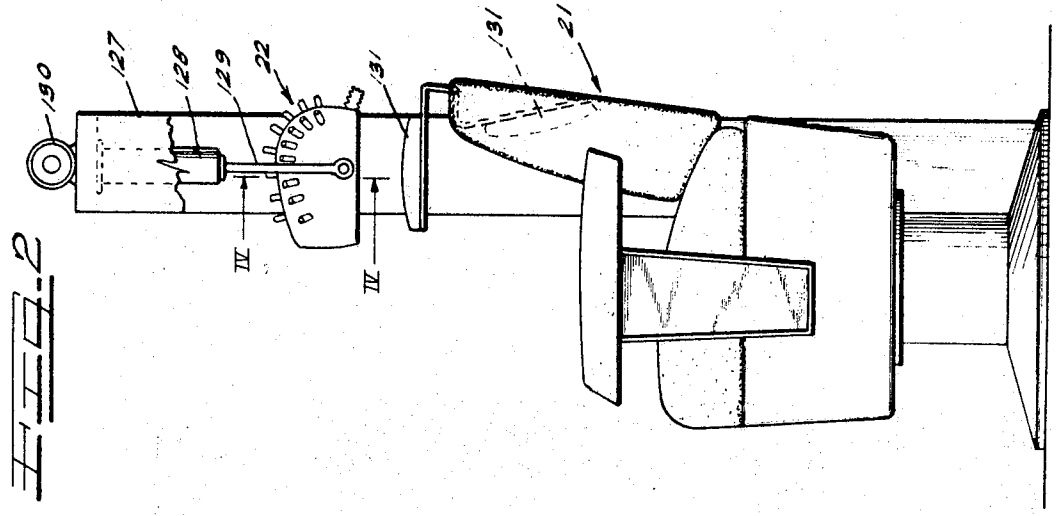


FIG. 2

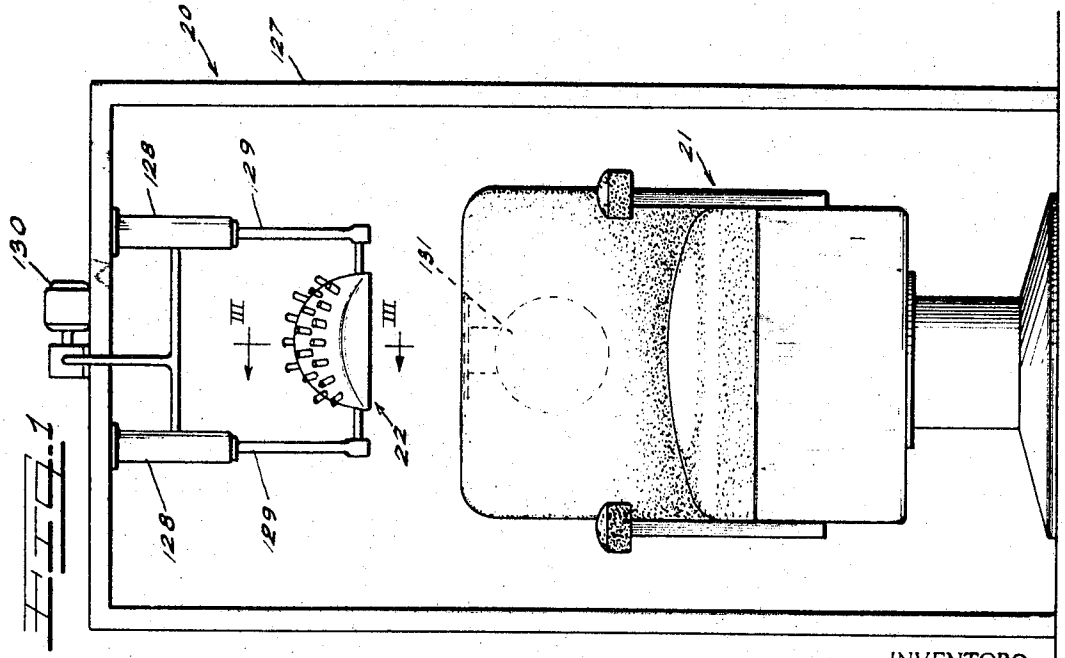
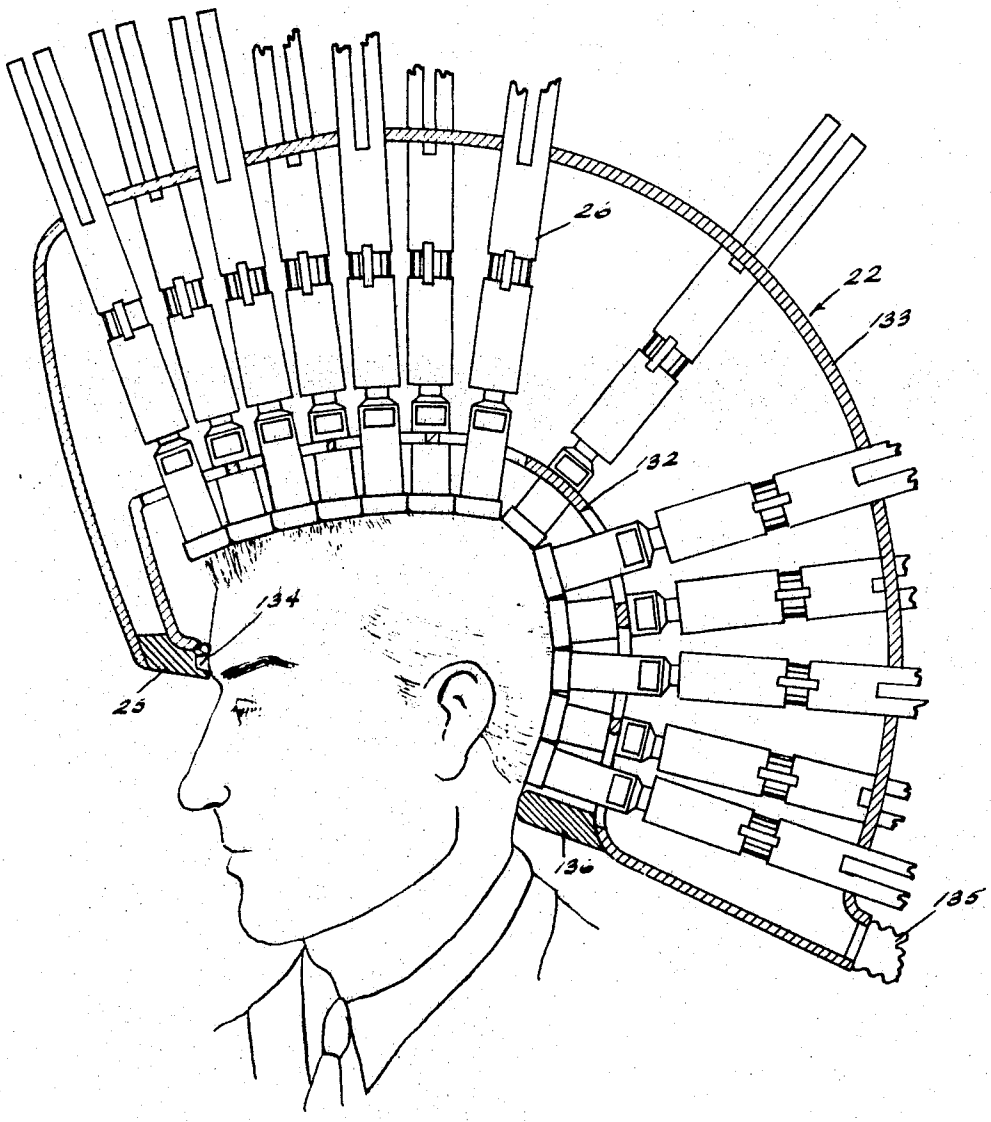


FIG. 1

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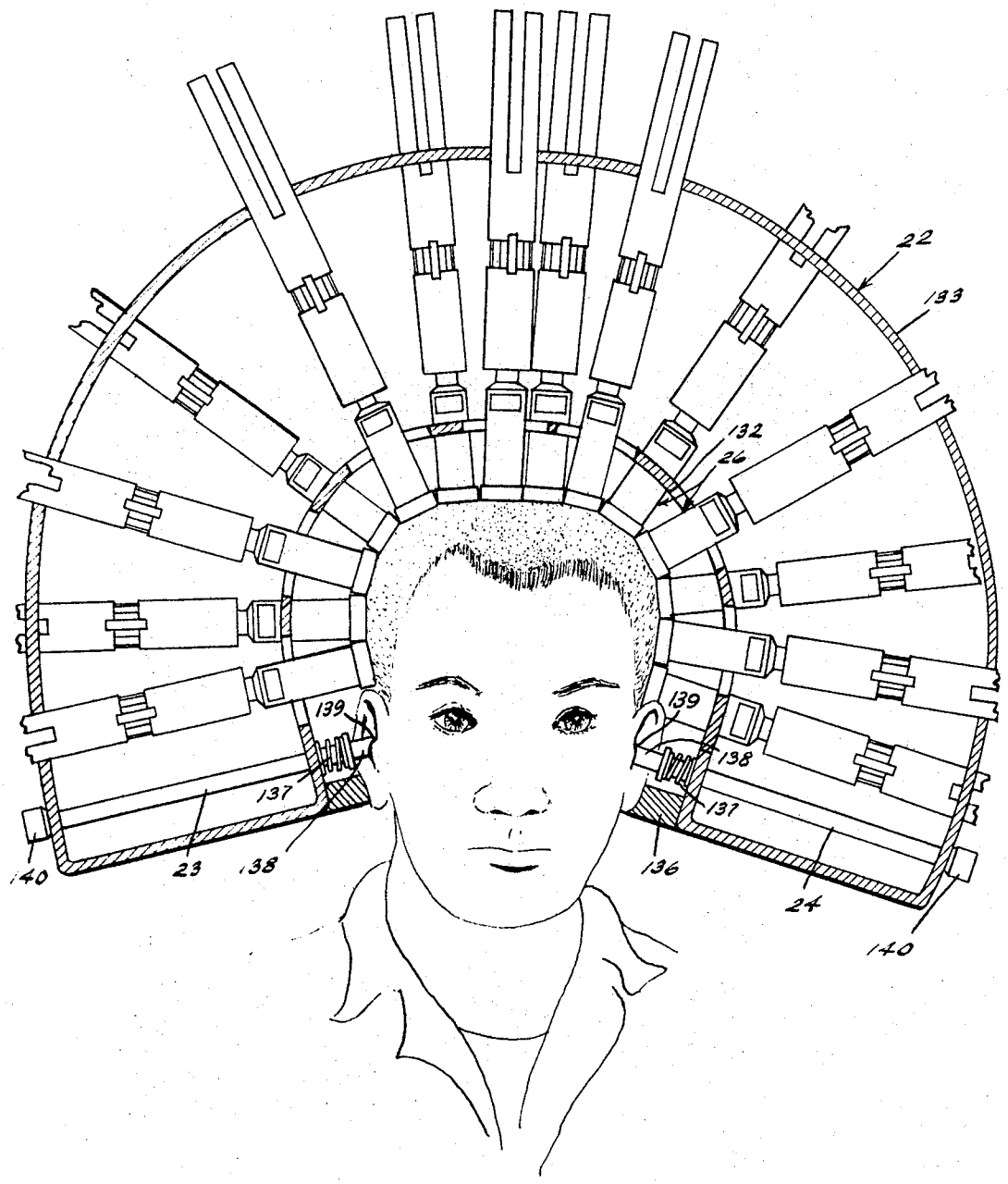
FIG. 3



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FIG. 4



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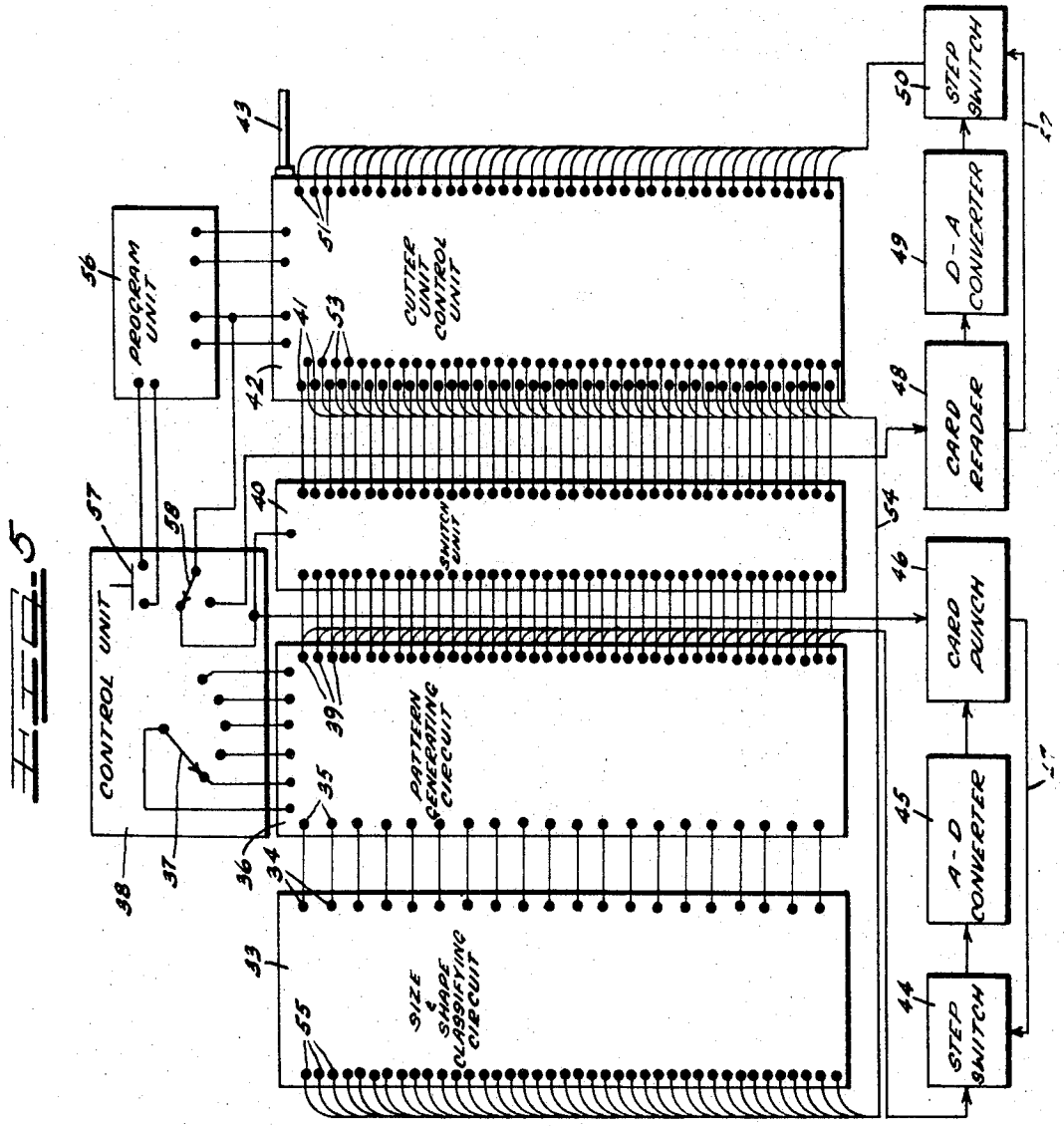


FIG. 5

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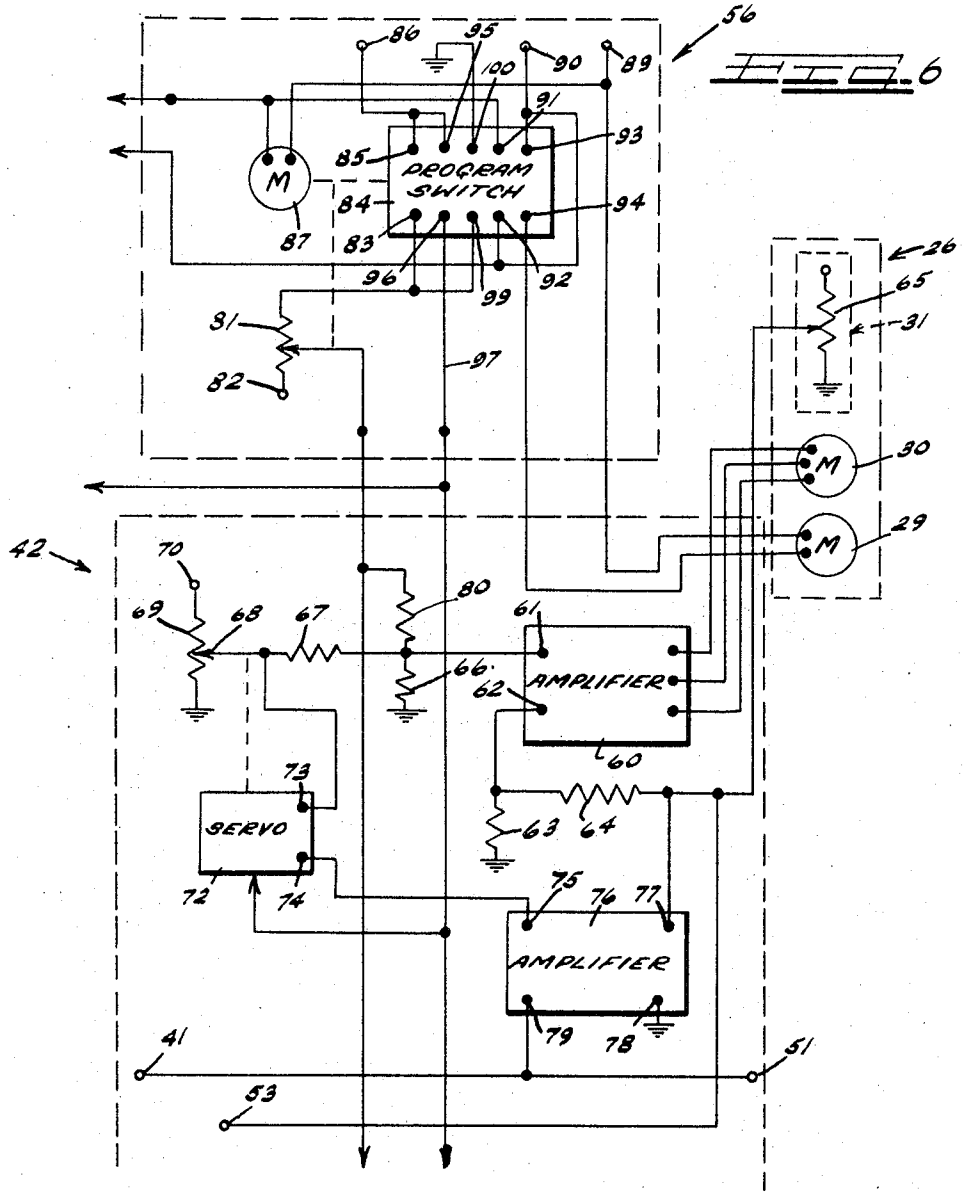
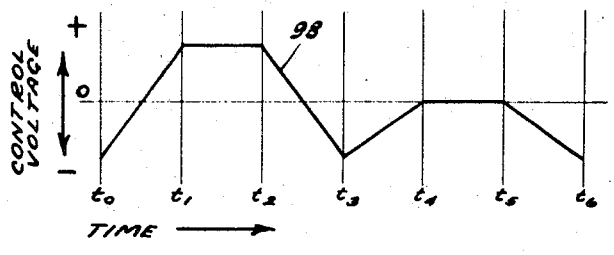


FIG. 6

FIG. 7



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FIG. 8

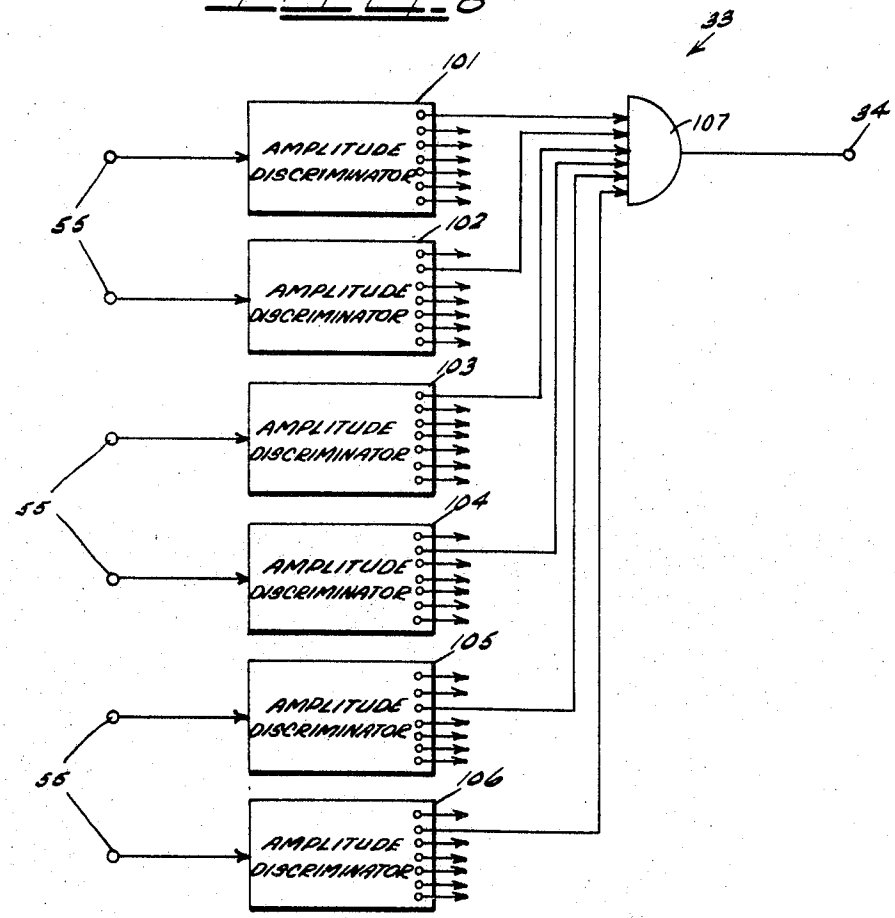
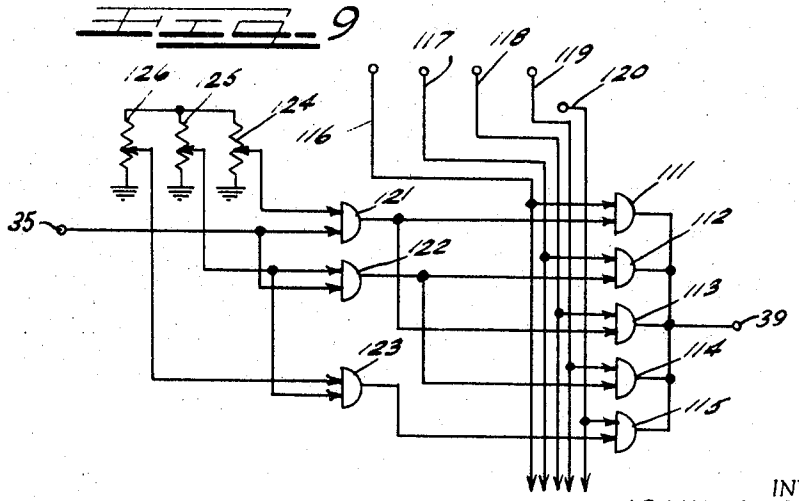


FIG. 9



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FIG. 10

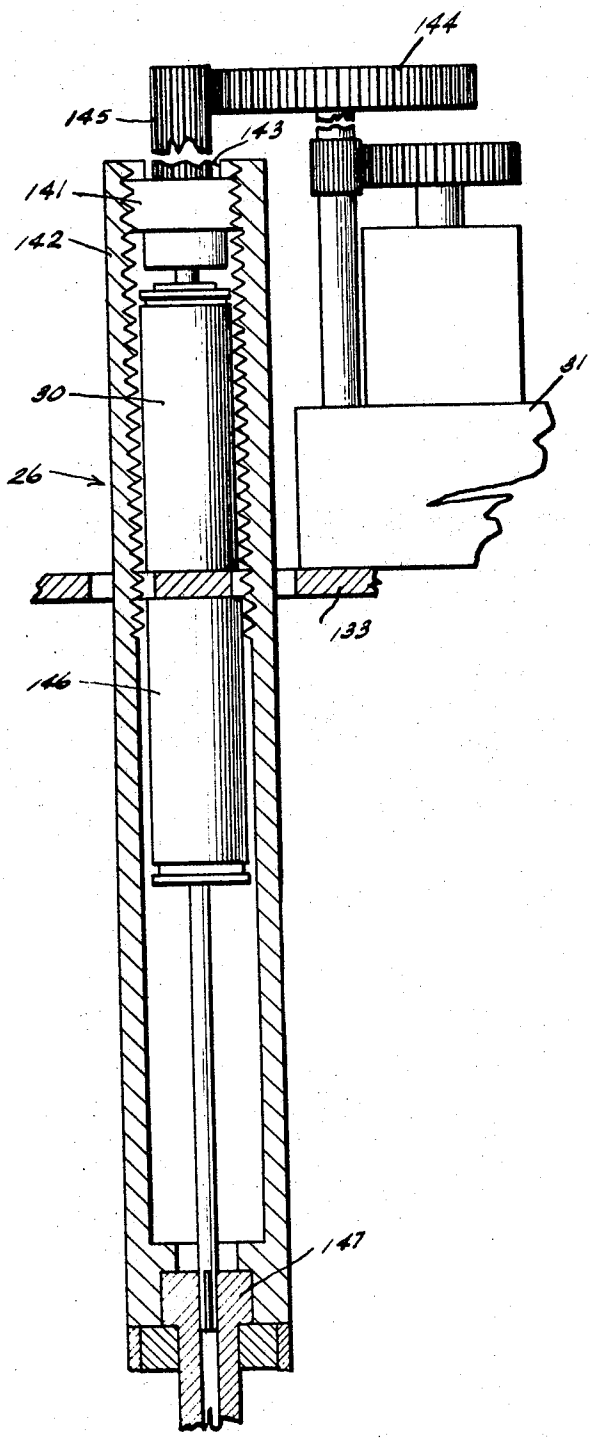
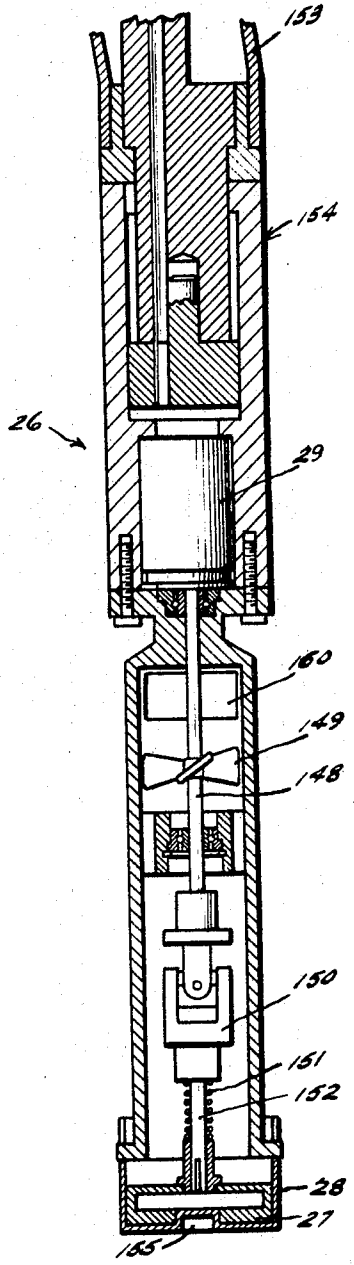


FIG. 11



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FIG. 12

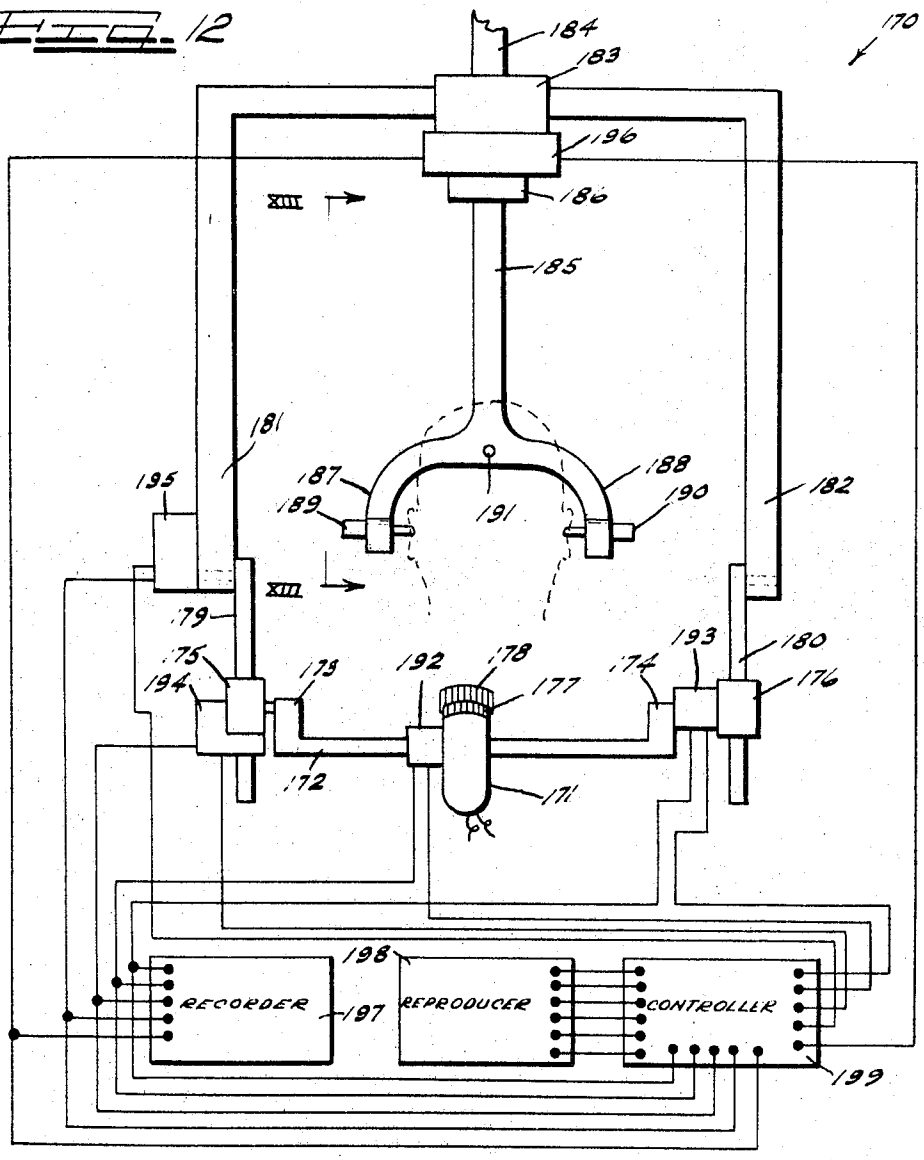
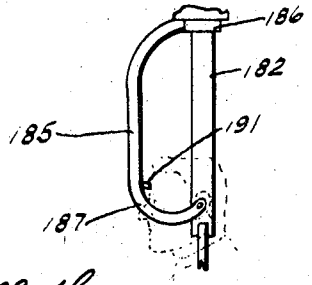


FIG. 13



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METHOD FOR AUTOMATICALLY CUTTING HAIR

CROSS-REFERENCES TO RELATED APPLICATIONS

This is a division of Dlouhy et al. U.S. application Ser. No. 240,537 filed Nov. 28, 1962, now U.S. Pat. No. 3,413,985.

The present invention relates to a machine and method for mechanically cutting hair on the head of a person whereby a complete haircut of a desired style is obtained in a single operation.

More particularly the invention relates to a method and machine for automatically cutting hair wherein a person positions his head for engagement with a haircutting mechanism and his head is measured as to size and shape. Mechanically driven automatic cutters are then positioned relative to his head in accordance with the size and shape thereof, and in accordance with a style of haircut desired, and the hair is then automatically cut to the proper length. In accordance with one system of the invention the measurements of head size and shape are taken by the cutting machine which is then controlled to yield the proper haircut. In accordance with another system the measurements of the head size and shape are taken and stored by a recording device such as on a punched card and the information on the card is later used for controlling a mechanical haircutter. In accordance with another system of the invention a record is made of the shape of a haircut during a cutting operation and this record is used to later control a mechanical cutter.

It is an object of the present invention to provide a method and mechanism which can be used to mechanically complete a haircut in a relatively short time without requiring manual cutting of the hair.

A further object of the invention is to provide a method and mechanism which will mechanically give a person a haircut of a desired style and length which is uniform and can be successively repeated with the same uniformity.

A further object of the invention is to provide a method and apparatus for mechanically cutting hair which is capable of giving haircuts of a substantial number of different styles within hair length limitations and is capable of changing styles by simple selection of the style desired.

Yet another object of the invention is to provide an improved mechanism wherein an individual can place a helmet means over his head with mechanical cutters mounted therein and wherein the cutters will be operted by a control system and will automatically perform a satisfactory haircut of a desired style in a very short time without hazard to the person.

A still further object of the invention is to provide an improved mechanical haircutting machine with appurtenances thereto which enable successive and reliable performance and which perform various functions such as cutting the hair uniformly by accurately positioning cutters, erecting the strands of hair for access to the cutters and removing the cut ends of hair.

Yet another object of the invention is to provide an improved mechanism for measuring the size and shape of the head.

A still further object of the invention is to provide improved mechanism for measuring the size and shape of the head and automatically analyzing the size and shape data and to classifying it, applying a factor determining the style of haircut to be obtained and providing an output signal for mechanically positioning cutters to obtain a custom haircut for the individual whose head has been measured.

Other objects, advantages and features will become more apparent with the teaching of the principles of the present invention in connection with the disclosure of the preferred embodiments thereof in the specification, claims and drawings, in which:

FIG. 1 is a front elevational view shown in somewhat schematic form of a chair structure for the automatic mechanical haircutting machine embodying the principles of the present invention;

FIG. 2 is a side elevational view of the mechanism of FIG. 1;

FIG. 3 is a vertical sectional view shown in somewhat schematic form and taken through the helmet of the haircutting machine taken substantially along line III–III of FIG. 1;

FIG. 4 is a vertical sectional view taken substantially along line IV–IV of FIG. 2 showing the relationship of the helmet to a person's head;

FIG. 5 is a schematic illustration of a recording and control circuit for the haircutting machine;

FIG. 6 is a circuit diagram of a portion of the control mechanism;

FIG. 7 is an illustration of the control voltage form;

FIG. 8 illustrates a portion of the size and shape classifying circuit;

FIG. 9 shows a portion of the pattern generating circuit;

FIGS. 10 and 11 respectively illustrate the upper and lower end of one of the haircutters;

FIG. 12 is a schematic showing of another embodiment of the invention for recording a haircut pattern, and duplicating the recorded pattern to mechanically complete a haircut, the figure generally being a front elevational view; and

FIG. 13 is a schematic side elevational view of the mechanism of FIG. 12 with portions omitted.

ON THE DRAWINGS

Referring to FIGS. 1 and 2, reference numeral 20 generally designates an automatic haircutting system constructed according to the principles of this invention. The person whose hair is to be cut sits in a chair 21 having a back rest which may be adjusted to position the head of the person directly under a helmet 22 which is then lowered down over the person's head. A pair of separate retractable positioners 23 and 24, FIG. 4, are then moved inwardly to engage the openings of the person's ears while another positioner 25, FIG. 3, engages the forehead of the person, to positively fix the position of the helmet 22 relative to the head, and to permit locating of the helmet in exactly the same position for successive haircuts.

A plurality of individual cutters units 26, FIGS. 3 and 4, are mounted in the helmet 22 and are arranged to operate simultaneously to rapidly cut the hair over the entire surface of the person's head to the proper length and to obtain a haircut of the desired style.

The construction of the cutter units 26 is described in detail hereinbelow. In general, each of the units 26 comprises a cutter blade 27, FIGS. 10 and 11, rotatable in a head 28, a motor 29 for rotating the blade 27, a reversible motor 30 for moving the head 27 inwardly or outwardly, toward or away from the adjacent portion of the person's head, and a sensing device 31 or 155 for developing a signal corresponding to the position of the head relative to the helmet, preferably in the form of a potentiometer 31. A sonar sensing device 151, FIG. 11 may be employed instead of the potentiometer as will be described later herein.

In the general operation of the system, the size and shape of the person's head is first measured and signals are developed according to the desired type of haircut to be obtained. In particular, the cutter heads are moved inwardly without rotating the cutter blades until all of the heads firmly engage the person's head. Reference signals are then developed which are supplied to a size and shape classifying circuit 33, FIG. 5, to develop an output signal on one of a plurality of output terminals 34, 20 output terminals being provided in the illustrated system, but it will be understood that more or less terminals might be employed.

The output terminals 34 are connected to input terminals 35 of a pattern generating circuit 36 which is connected to a selector switch 37 in a control unit 38. Switch 37 is set according to the desired type of haircut.

The circuit 36 has a plurality of outputs 39 corresponding in number to the number of cutter units, there being 40 in the illustrated system. Analog voltages are developed on such output terminals 39 corresponding to the proper hair length at the various points of the perons's head corresponding to the cutter

units. Such voltages may be fed directly through a switch unit 40 to a plurality of inputs 41 of a cutter unit control circuit to directly control the positions of the cutter heads, the control circuit 42 being connected through a cable 43 to the positioning and drive motors and position sensors of the cutting head units. In addition, or in the alternative, such analog voltages are fed through a stepping switch 44 to an analog-to-digital convertor 45 having its output connected to a card punch unit 46, to punch holes in a card in accordance with the respective values of the analog voltages on the output terminals 39 of the pattern generating circuit 36. Stepping switch 44 is controlled from the card punch unit 46 through a line 47 to sequentially connect the forty output terminals 39 of the pattern generator circuit to the analog-to-digital convertor 45.

The cards may thereafter be inserted in a card reader unit 48 which is connected to a digital-to-analog convertor 49 connected through a stepping switch 50 to imput terminals 51 of the cutter control circuit 42, stepping switch 50 being controlled from the card reader 48 through a line 52.

During the initial portion of the operation when the size and shape of the person's head are measured, the cutter unit control circuit 42 develops signals on terminals 53 which are applied through a cable 54 to inputs 55 of the size sorting and classifying circuit 33. Signals are then applied directly from the pattern generating circuit 36 through the switch unit 40 to the cutter unit control circuit 42 and are also applied through the stepping switch 44 and convertor 45 to the card punch 46. In the alternative, a card may be inserted in the card reader and the signals may be applied to the input terminals 51.

In either case, after proper signals are applied to the cutter unit control circuit 42, FIG. 5, the cutters are fully retracted outwardly away from the person's head. The cutter drive motors 29, FIG. 10, are then energized for operating the cutter blade and the cutter units are then moved inwardly relatively slowly until they reach the positions determined by the pattern signals previously applied by motor 30. The cutter units are then moved outwardly to the fully retracted position, the cutter motor 29 is deenergized and the operation is completed.

This sequence of operation is controlled from a program unit 56, FIG. 5, which is controlled by a start button 57 in the control unit 38 and also from a selector switch 58 which controls whether the pattern control signals are applied through the switch unit 40 or whether they are developed from the card reader 48.

FIG. 6 illustrates the circuit of the program unit 56, one channel of the cutter unit 42, and the connections therefrom to the associated one of the cutter units 26. Referring thereto, the reversible positioning motor 30 is connected to the output of an amplifier 60 having a first input terminal 61 to which a control signal is applied and having a second input terminal 62 connected through a resistor 63 to ground and through a resistor 64 to the contact of a potentiometer 65 which is connected between ground and a suitable reference voltage source, the potentiometer 65 being a part of the position sensor 31. When a certain voltage is applied to the input terminal 61 of the amplifier 60, the positioning motor 30 is energized in one direction or the other to move the cutter head and operate the position sensing potentiometer 65 until the voltages applied to input terminals 61 and 62 are equal. By way of example, the cutter head may be in a fully retracted outward position when the control voltage on the line on the terminal 61 is zero and may be moved inwardly to a maximum inward position when a control voltage of 0.1 volt is applied to the input terminal 61.

Two signals are combined to develop a control signal which is applied to the input terminal 61, one signal being a reference signal corresponding to the desired final position of the cutter head and the other being a control signal from the program circuit 56 which causes the cutter head to be initially moved inwardly, with the cutter blade not operating, into engagement with the person's head for measuring purposes, to be then moved outwardly to its retracted position, to thereafter move gradually inwardly with the cutter blade operating until the desired cutting position is reached, and finally to be moved outwardly to the retracted position.

In particular, the input terminal 61 is connected through a resistor 66 to ground and through a resistor 67 to the contact 68 of a reference signal potentiometer 69, which is connected at one end to ground and at the other end to a terminal 70 to which a fixed reference voltage is applied. The contact 68 is mechanically operated by a servounit 72 having input terminals 73 and 74. Input terminal 73 is connected to the contact 68 while input terminal 74 is connected to one output terminal 75 of an amplifier 76 having a second output terminal 77 connected to the contact of the position sensing potentiometer 65. The amplifier 76 has a grounded input terminal 78 and a second input terminal 79 connected to terminals 41 and 51 to receive a signal either directly from the pattern generating circuit 36 or from the card reader 48 through the convertor 49 and stepping switch 50.

The servounit 72 operates to set the contact 68 of potentiometer 69 at a position such that the voltage thereof is equal to the voltage developed by the position sensing potentiometer 65 with the cutting head pressed against the person's head, plus a voltage developed between the output terminals 75 and 77 of the amplifier 76, corresponding to the desired length of hair at the position of the cutting head.

After the contact 68 is set, the servounit 72 is deactivated. Assuming the resistance ratios of the resistors 66, 67 and 63, 64 to be the same, and assuming also that no other input signal is applied to the termainal 61, the amplifier 60 can then operate to energize the motor 30 to move the head to the proper position.

An override control voltage is applied to the terminal 61 of the amplifier 60 from the program circuit 56. In particular, terminal 61 is connected through a resistor 80 to the contact of a potentiometer 81 connected between a terminal 82 and a terminal 83 of a program switch unit 84 having another terminal 85 connected to a terminal 86. A fixed negative voltage is applied to the terminal 82 while a fixed positive voltage is applied to the terminal 86.

The potentiometer 81 and also the program switch 84 are operated by a motor 87 which has one terminal connected to a power supply input terminal 89 and a second terminal connected through the start button 57 in the control unit 38 to a second power supply input terminal 90. A holding switch in the switch unit 84 is connected between terminals 91 and 92 in parallel with the start button 57.

The switch unit 84 has another switch contact connected between terminals 93 and 94 for control of energization of the cutter blade drive motors 29 and also has a contact connected between terminals 95 and 96 for applying an activating signal on a line 97 connected to the servounit 72 and also to the selector switch 58 of the control unit 38.

In operation, the start button 57 is manually depressed to energize the motor 87 which then drives the program switch unit 84, the holding contact between terminals 91 and 92 being then closed. A voltage is applied from terminal 86 through the contact between terminals 83 and 85 to the potentiometer 81 and the potentiometer 81 is rotated to generate a control voltage having a form as illustrated by the curve 98 in FIG. 7.

Initially, at a time t_0, the control voltage has a negative value sufficient to insure that the cutter heads are in their fully retracted positions. As the contact of the potentiometer 81 is rotated by the motor 87, the control voltage moves in a positive direction to move the cutter heads inwardly until they are stopped by engagement with the person's head, the voltage at time t_1 being sufficiently positive to produce maximum inward movement of the cutter heads. The drive torque of the positioning motors may be limited electrically or otherwise to insure against undue pressure on the person's head and to insure against overheating of the positioning motors.

From time t_1 to time t_2, a switch contact between terminals 95 and 96 is closed to activate the servounit 72 and at the

same time signals are applied to terminals **41** or terminals **51**, depending upon the position of the selector switch **58**. In one position of the selector switch **58**, the switch unit **40** and the card punch **46** are activated while in the other position thereof, the card reader **48** is activated. In either case, the contact **68** of the reference potentiometer **69** is set at a position corresponding to the desired final cutting position of the cutting head. At time t_2, the servounit **72** is deactivated and from time t_2 to time t_3, the control voltage is shifted to a negative value to again fully retract the cutting heads. At time t_3, the upper end of the potentiometer **81** is connected to ground through a contact between terminals **99** and **100** of the switch unit **84**. At the same time, the cutter blade rotating motors **29** are energized. From time t_3 to time t_4, the control voltage is gradually reduced from a negative value to a zero value, thereby moving the cutter head inwardly to a position as determined by the setting of the movable contact **68** of the potentiometer **69**. The cutter blade rotating motors **29** may then continue rotating until a time t_5. From time t_5 to time t_6, the control voltage is moved in a negative direction until the cutter heads are fully retracted, thereby completing a cycle of operation.

FIG. **8** illustrates a portion of the size and shape classifying circuit **33**. As shown, six of the input terminals **55** are connected to amplitude discriminator circuits **101—106**, each having a plurality of output terminals on which output signals are selectively developed according to the amplitude of the signal on the corresponding one of the input terminals **55**. An output terminal from each of the amplitude discriminators **101—106** is connected to an input of an AND circuit **107** having an output connected to one of the output terminals **34**.

For purposes of explanation, it may be assumed that is is desired to produce an output signal on the illustrated output terminal **34** when the person's head is large and rounded. The amplitude discriminator **101** may respond to a signal from the cutter unit at the top of the person's head in the vertical plane of the ear openings. The amplitude discriminator **102** responds to the signal from the cutter head at the front top of the head, the amplitude discriminator **103** responds to the signal from a cutter head at the side of the person's head, above one ear, the amplitude discriminator **104** responds to the signal from a cutter head at a position intermediate the ear and the top of the person's head, the amplitude discriminator **105** responds to a signal from the cutter head at the back of the person's head, and the amplitude discriminator **106** responds to a signal from the cutter head at a position intermediate the back and top of the person's head.

The other outputs of the amplitude discriminators **101—106** are connected through other AND circuits to other output terminals **34** in a similar fashion. It may be noted that this circuit design is based upon the assumption that the shape of the person's head is symmetrical and responds to only a limited number of measurement points. If it is desired to take into account nonsymmetrical heads and/or to obtain more accurate indications, more of the input terminals **55** may be connected to additional amplitude discriminators. In general, however, it is necessary to only use a limited number of the input terminals **55**, even through all of such input terminals are shown connected in FIG. **5**.

FIG. **9** illustrates a portion of the pattern generating circuit **36**. In this circuit, one of the output terminals **39** is connected to the outputs of five AND circuits **111—115** having inputs respectively connected to lines **116—120** connected to input terminals which are connected to the terminals of the selector switch **37**, the movable contact of the selector switch **37** being connected to a terminal to which a suitable enabling voltage is applied.

A first input terminal **35** is connected to inputs of three AND gates **121**, **122** and **123** having second inputs connected to potentiometers **124**, **125** and **126** which are connected to a suitable reference voltage source and which may be adjusted to obtain desired voltages. As illustrated, the output of the AND gate **121** is connected to inputs of both AND gates **111** and **113**, the output of AND gate **122** is connected to inputs of both AND gates **112** and **114**, and the output of the AND gate **123** is connected to an input of the gate **115**.

Assume, for example, that the person's head is large and rounded to apply a signal to the illustrated input terminal **35** and to enable the AND gates **121—123**. In one position of the selector switch **116**, an enabling voltage is applied to the AND gate **111**, so that an outut voltage is developed on the illustrated output terminal **39** equal to the voltage developed by the potentiometer **124**. Similarly, when the selector switch is in a second position to apply an enabling voltage on the line **117**, the gate **112** is enabled and an output voltage is developed equal to the voltage from the potentiometer **125**. The same principle is of course followed in developing output signals on all of the output terminals **39** of the pattern generating circuit. The circuit is simplified to a considerable extent by assuming the person's head to be symmetrical, in which case a number of the output terminals can be directly connected, and the number of output voltages required to be generated can be cut approximately in half.

Referring to the mechanical apparatus in greater detail, FIGS. **1** and **2** which show the chair **21** embody an overhead frame **127** for supporting the helmet **22**. On the frame **127** are cylinders **128** with pistons having piston rods **129** which support the helmet **22**. A hydraulic pump **130** has a controlled output to raise the helmet upon completion of a haircut and to lower the helmet onto the person's head for measuring the head and/or cutting the hair.

FIGS. **3** and **4** show the helmet in greater detail with the individual cutters **26** mounted therein. The helmet includes an inner shell **132** and an outer shell **133** and the cutters are rigidly supported on the outer shell and pass through openings in the inner shell. The openings are sufficiently large to permit the lower portion of the cutter to move in a circular path. The circular paths of the adjacent cutters overlap and the cutters are operated in unison so as to completely cut the hair.

The forehead engaging positioner **25** may embody an operating switch **134** so that the mehcanism will be started automatically when it is lowered onto the person's head or may be started by the person tilting his head forward against the positioner **25**.

A flexible shield **136** extends around the back and sides of the helmet so that hair does not fall downwardly and so that a flow of air which is induced into the space between the shells **132** and **133** of the helmet will pass upwardly to carry away the hair and to cause the hair to stand on end. Air enters the space within the shell **132** around the edges of the shield **136** and flows upwardly through the openings beside each of the cutters in the shell **132**. An additional flow of air carrying away hair from the cutter will be induced by a fan **149** within the cutter, as shown in FIG. **11**, which will be described in greater detail. Flow into the helmet is caused through a conduit **135** which is connected to a vacuum blower for carrying away the hair.

It is contemplated to use the flow of air through the individual cutters and through the helmet to cause the hair to stand on end for uniform cutting as the cutters move inwardly. It is also contemplated that in some instances other means for erecting the hairs may be employed such as by treating the hair ahead of time with a brush to cause the hair to stand on end. In some instances the helmet may be provided with conductors for creating a static electric field to cause the hair to rise upwardly as attracted by the field. If desired the cutters may be provided with lifters which will project forwardly ahead of the cutters to raise the hair. In this arrangement it will be necessary to have the cutter travelling in a uniform progressing direction so that the lifters will continually point forwardly. These lifters may be of the type having a thin forwardly extending projection with an inclined leading edge so that the hair will ride upwardly on the edge and be raised ahead of the cutter.

While a preferred cutter arrangement is shown, other cutters may be employed such as of the type using a powered

clipper. A row of cutters may be employed which extends across the head and progresses from back to front along the head. Or if desired, the row may extend along the head from front to back and progress laterally back and forth. With the cutters illustrated a safety measure is introduced since they will not cut the skin should they, for example, engage the ear. If desired however, an ear cup may be employed within the helmet which bends the ear forwardly and downwardly for improved access to the hair above the ears.

The helmet **22** must be accurately positioned relative to the head and for this purpose the forehead positioner **25** and the ear plungers **23** and **24** are provided. The ear plungers are illustrated as being slidably mounted on the shells **132** and **133** with springs **137** to urge the plungers inwardly. Each plunger incorporates an elongated rod **138** with a gripping knob **140** at the outer end so that it may be drawn outwardly out of the ears. On the inner end is a rounded end **139** which seats in the ears and plugs the ears to keep out hair and also to provide a noise barrier. This will block the noise of the cutters and the sound of the rushing air as hair is withdrawn from the cutters and helmet. A switch interlock may be provided if desired so that the helmet cannot be raised with the equipment of FIGS. **1** and **2** until the plugs are out of the ears or the plugs may be somewhat yieldable to prevent damage to the ears should the helmet be raised while the plugs are engaged.

When the helmet is raised, the cutters will be suitably sterilized such as by an ultraviolet light **131** which recesses the back of the chair **21** when the helmet is lowered, and which swings into the solid line position shown in FIG. **2** for sterilizing the inside of the helmet **22** and the cutters.

The cutters **26**, as shown in FIGS. **10** and **11**, are rigidly mounted on the outer shells **133** of the helmet, which also supports the motor **30** for moving the cutters in and out.

The motor **30** drives a nut **141** within the barrel **142** of the cutter and the barrel is internally threaded. The barrel is provided with a slot **143** so that the helmet can extend across through the slot for mounting the motor **30** and supporting the cutter.

The cutter is driven in its oscillating movement to cover an area larger than the cutter head by a cutter oscillating motor **146**. The motor **146** is provided with a shaft to drive an eccentric shaft **147** which connects between the upper and lower part of the cutter housing with the lower portion of the shaft **147** eccentrically mounted in the lower portion of the cutter. Flexible springs **153** connect the upper portion **142** and the lower portion **154** of the cutter housing preventing the lower portion from rotating.

The blade driving motor **29** drives a shaft **148** which also carries a fan **149** for drawing air upwardly to discharge it through openings **150** in the cutter housing. The blade shaft **148** drives through a universal coupling **150** to drive a lower shaft **152** carrying a coil compression spring **151** which urges the inner blade **27** against the stationary blade **28**.

While the size and shape of the head may be detected as above described by moving the cutter down against the head surface, it is also contemplated that the head surface may be detected electrically. A detector **155** may be mounted in the stationary blade **28**. The detector **155** sends out and receives sonic waves to measure the distance to the head. The wave signal may be fed back to the classifying circuit **33** as above described. The detector **155** may also be used to control the cutting position of the cutting head since it will send back a signal indicating its distance from the head surface. Suitable wires will be run up along the outer surface of the cutter from the detector **155**.

For use with the potentiometer to transmit a signal of cutter position, the nut **141** has a toothed shaft **145** extending upwardly therefrom driving the potentiometer **31** through a gear train **144**. The potentiometer is mounted on the outer shell **133** of the helmet.

Referring to FIG. **12**, reference numeral **170** generally designates a modified system wherein a conventional type of hair clipper **171** may be first operated by a master barber to cut a perons's hair and to simultaneously develop a recording which may thereafter be played back to automatically operate the clipper without the assistance of the barber.

The clipper **171** is so supported as to permit the required movements thereof while generating signals indicating the position of the clipper relative to the person's head, and to permit the subsequent automatic control of the clipper movement. In particular, the clipper **171** is supported for horizontal sliding movement on a bar **172** of square cross section which is supported at its ends on offset portions **173** and **174** rotatably journaled from sleeves **175** and **176**. The axis of rotative movement of the bar **172** relative to the sleeves **175** and **176** is preferably aligned with the cutter blade assembly **177** of the clipper **171**. A suitable comb device **178** may be attached to the clipper **171** to properly lift the hair during cutting, the comb **178** or its connection to the clipper being preferably flexible so as to allow operation with the cutter blade assembly **177** at any desired distance from the surface of the person's head.

The sleeves **175** and **176** are slidable on arms **179** and **180** which are journaled from the lower ends of arms **181** and **182**, for movement about a common horizontal axis which may preferably extend through approximately the center of the person's head.

The arms **181** and **182** are fixedly secured to a hub member **183** which is supported at the lower end of the vertical rod **184** for rotation about a generally vertical axis. The rod **184** may be suspended from the ceiling or any other fixed support.

Means are provided for fixing the position of the rod **184** relative to the person's head and, in particular, a rod **185** is provided which extends downwardly from an enlarged head portion **186** at the lower end of the rod **184**. The lower end of the rod **185** is bifurcated to provide two portions **187** and **188** and retractable rods **189** and **190** are supported at the lower ends of the portions **187** and **188**, for insertion in the openings of the person's ears. A positioner **191** is adapted to engage the person's forehead, to thus positively fix the position of the support rod **184** relative to the person's head.

A plurality of servounits are provided for measuring the movements and for effecting the movements as required. Each unit may, for example, comprise a selsyn or resolver device for developing a signal having a phase determined by linear or angular position, and an electric motor coupled through suitable gears for effecting the required movement. In particular, a servounit **192** is provided for measuring and producing movement of the clipper **171** along the bar **172**, a servounit **193** is provided for measuring and effecting rotation of the clipper **171** about the axis of support of the portions **173** and **174** from the sleeves **175** and **176**, a servounit **194** is provided for measuring and effecting movement of the sleeves **175** and **176** along the arms **179** and **180**, a servounit **195** is provided for measuring and effecting movement of the arms **179** and **180** about the axis of support thereof from the arms **181** and **182**, and a servounit **196** is provided for measuring and effecting rotation of the hub **183** and arms **181** and **182** about the axis of the rod **184**. If desired, a unit like the unit **184** and in parallel therewith may be provided between the sleeve **186** and the rod **180** to obtain more positive support and actuation. Similarly, a unit like the unit **195** may be provided between the arm **180** and the arm **182**.

The position sensing portions of the servounits **192—196** are connected to inputs of a recorder, which may preferably be a multichannel tape recorder and which may preferably have an additional channel for recording of a reference signal. Suitable recorders are known in the art.

After recording of the position signals while the clipper **171** is operated by a master barber, the tape or other recording medium may be played back in a reproducer **198** having five channel outputs and an additional reference signal output connected to a controller **199**. The controller **199** has five additional inputs connected to the position signal outputs of the servounits **192—196**, and has outputs connected to the motor portions of the servounits **192—196**, the motor units being

reversible and being driven in accordance with the magnitude and polarity of any difference between the signals applied from the reproducer **198** and the signals applied from the position sensing portions of the servounits **192—196**.

The system **170** may be operated in a manner similar to the system **20** as described above. In particular, a specially prepared tape may be played in the reproducer **198** and, with the clipper **171** being deenergized, the clipper **171** may be caused to traverse the surface of a person's head, while maintained in firm engagement therewith, to thus develop a recording of the size and shape of the person's head in the recorder **197**. The recording so obtained may be then analyzed electronically by a size and shape classifying circuit to develop an output which may be fed to a pattern generating circuit, along with a signal from reproducing of the tape, to develop another tape which will perform the required movements of the clipper **171** in the predetermined pattern.

The drawings and specification present a detailed disclosure of the preferred embodiments of the invention, and it is to be understood that the invention is not limited to the specific forms disclosed, but covers all modifications, changes and alternative constructions and methods falling within the spirit and scope of the principles taught by the invention.

We claim:

1. The method of cutting hair mechanically comprising:

obtaining and recording specific information concerning the size and shape of a person's head;

providing a general record of information concerning a particular hair style without reference to the size and shape of said person's head;

providing an automatic hair cutting machine susceptible to utilization of said specific and general information in controlling the cutting operation thereof; and

feeding said specific and general information simultaneously to the automatic hair cutting machine to cut the hair of the person in said particular hair style.

2. A method for automatically cutting a head of hair comprising:

providing an adjustable hair cutting means having drive signal responsive means for controlling the operation thereof;

sensing the distance between the cutting means and the head to produce a first electrical signal;

selecting a predetermined distance between said cutting means and the head to produce a second electrical control signal;

comparing said first and second control signals and providing a drive signal in accordance with said comparison; and

feeding said drive signal to said hair cutting means for controlling the operation thereof.

3. The method of providing information for controlling the operation of an automatic hair cutting machine in the cutting of the hair of an individual's head comprising the steps of:

providing a plurality of individually positionable hair cutters;

providing an output signal for each cutter corresponding to the position thereof;

moving the cutters in a cutting position adjacent corresponding portions of the individual's head; and

recording the output signals produced when the cutters are in said cutting positions for subsequent use in controlling the operation of the hair cutting machine.