Jan. 18, 1966 P. F. SMITH 3,229,578

FLEXIBLE MIRROR WITH INDIVIDUALLY DEFLECTABLE PORTIONS

Filed Jan. 2, 1962 2 Sheets-Sheet 1

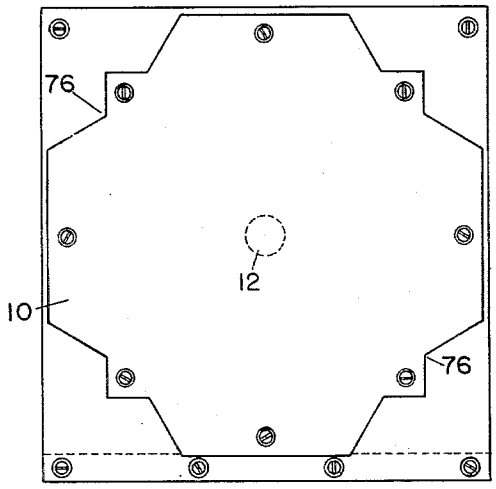


FIG 1

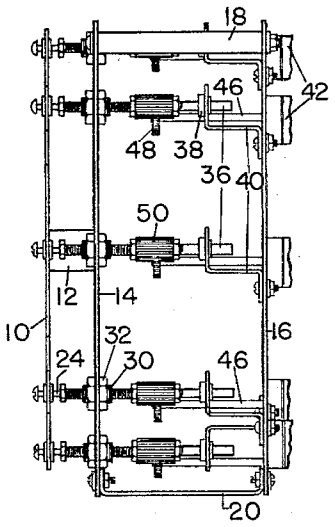


FIG 2

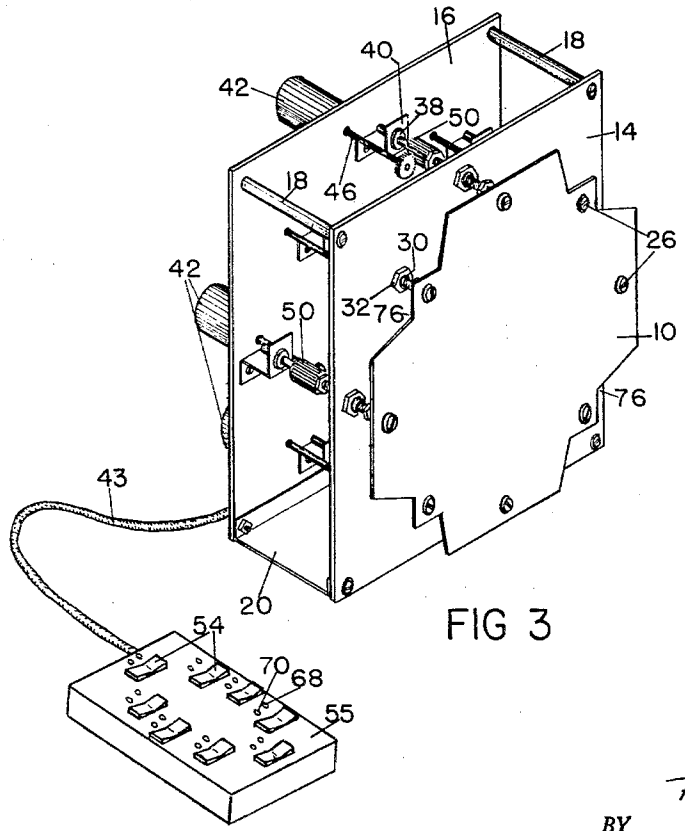


FIG 3

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FIG. 5

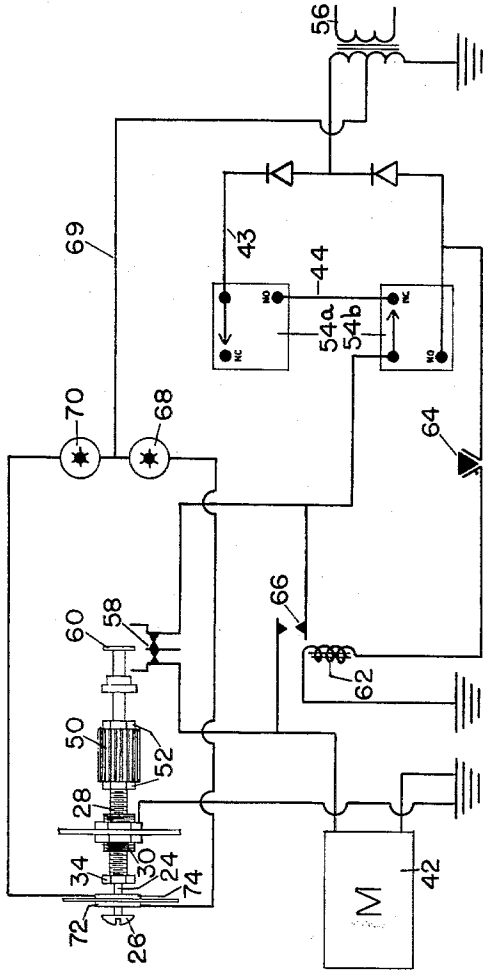
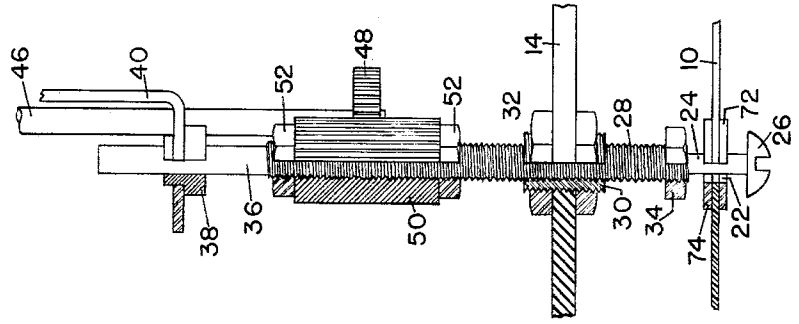


FIG. 4



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3,229,578

FLEXIBLE MIRROR WITH INDIVIDUALLY DEFLECTABLE PORTIONS

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5 Claims. (Cl. 88—76)

The present invention relates to a variable reflector, and more particularly, to a reflector that may be adjusted to vary the dimensions of the image reflected by it.

A general object of the invention is to provide a device or apparatus of the character described by means of which photographs, drawings, transparencies, light patterns and varied design representations may be rapidly and easily and precisely distorted, corrected, enlarged or diminished, in whole or in part.

Another object of the invention is to provide the apparatus or device aforesaid with accurate and precise movement to accomplish its object; such movement being accomplished either manually, mechanically or electrically, and from a remote position, if desired.

This invention is particularly directed to the provision of a device or apparatus that will be especially useful in the reconstruction, from description, of the facial features of a person, as is frequently required in police work, for instance. In such instances, the police must reconstruct a close approximation of a person's facial features excusively from the description of the person as supplied by witnesses. This is accomplished by superposing numerous drawings or transparencies of facial parts on one another until a satisfactory composite picture of the facial features of the person sought is attained. This procedure is laborious and time consuming and not completely satisfactory because, unless an infinite number of pictures or transparencies of individual facial features and their variations is used, it is not possible to attain a close approximation of the actual facial features of the person. This invention, therefore, is directed to the provision of a device of the character described that will facilitate, speed, and render highly flexible and exact the procedure of facial reconstruction by permitting the construction of many and varied types of faces and facial parts or features from any composite picture, without the need for varying such composite picture by the multitudinous replacement or superposition of additional pictures of the various facial features on the composition and with the use of a minimum of drawings, photographs or transparencies.

The present invention is also directed to the provision of a device or apparatus that will permit an individual to distort, correct, enlarge or diminish his own facial features or body parts or that of others, in whole or in part, for amusement or for other purposes.

For the foregoing purposes, the present invention contemplates the provision of a reflector having a plurality of radially-disposed areas or sectors that may be, individually and independently of one another and in any selective combination, offset relative to the normal plane of the reflector, in either direction, to magnify or reduce the dimensions of any desired portion or feature of a face or other object that is projected thereon.

The present invention also contemplates the provision of an apparatus or device, of the character described, to obtain magnification or reduction of the image or any portion thereof, to substantially any reasonably desired degree.

The present invention contemplates, additionally, the provision of a device or apparatus, of the character described, which may be manually, mechanically, or electromechanically controlled.

The present invention contemplates further the provision of a device or apparatus, of the character described, which may be utilized with great ease and facility, to have the varied reflections thereof viewed directly from the reflector or projected or reflected to a camera, screen or any other suitable apparatus.

The present invention contemplates still further the provision of apparatus, of the character described, that is simple and easy to use; is of relatively simple construction and may be made compact and portable.

The foregoing and other objects and advantages of the apparatus of the present invention will become more readily apparent to those skilled in the art from the embodiment thereof shown in the accompanying drawing, and from the description following. It is to be understood, however, that such embodiment is shown by way of illustration only, to make the principles and practice of the invention more readily comprehensible, and without any intent of limiting the invention to the specific details therein shown.

In the drawings:

FIG. 1 is a front elevation of one embodiment of an adjustably variable reflecting apparatus of the present invention;

FIG. 2 is a side elevation of the same, partly broken away;

FIG. 3 is a perspective view of the apparatus of FIG. 1, shown in association with a control panel therefor;

FIG. 4 is an enlarged, partly sectional and partly elevational view of a single reflector-adjusting unit of the apparatus of the invention; and

FIG. 5 is a schematic view of a single reflector-adjusting unit of the apparatus and one electric circuit by which it may be operated and controlled.

Referring now, in greater detail, to the illustrated embodiment of the invention, the apparatus is shown to comprise a reflector **10**, made of a flexible material such as burnished thin sheet metal, or, preferably, a synthetic plastic mirror. The mirror **10** is mounted, by a central point, that is, a point remote from at least three of its edges; but preferably, for most purposes, by its exact center, as by an adhesive, on a stud **12**, that is secured or mounted in any desired manner on the inner one of a pair of spaced parallel walls, **14** and **16**, respectively, which may be connected by spacing posts **18**, at the top corners thereof, and by a spacing plate **20**, at the bottom, to form an upright frame; the mirror-supporting stud **12** being of sufficient length to provide adequate space between the mirror **10** and the wall **14** for the purposes hereafter made clear.

Formed around the marginal edge portion of the mirror **10**, in preferably regularly spaced relation to one another, are a plurality of openings **22**, whose edge portions may be reinforced, as by eyelets or by reinforcing washers secured on each side, as illustrated. Through each of the openings **22** is passed a headed pin **24**, having its head **26**, on the exterior of the mirror and overlying and engageable against the edges of the opening. The pin **24** is of substantially greater length than the thickness of the mirror **10**, and has its inner end set into the end of a closely threaded rod **28**, that is engaged in an internally and preferably also externally threaded sleeve **30**, held in an appropriately disposed opening formed in the frame wall **14** and preferably adjustably held in place in the wall **14** by lock nuts **32**, one to each side of the wall **14**. A stop nut **34**, may be threaded and locked on the end of the rod **28**, nearest the mirror **10**, which nut **34** may serve as an inner abutment against the mirror **10**.

It will be readily apparent that the rotation of the rod **28** within the sleeve **30**, which is stationary on the frame wall **14**, in one direction, will cause the head **26** of the

pin 24 to impinge against the outer surface of the mirror 10 to deflect it inwardly towards the frame plate 14, to render convex the reflecting surface portion of the mirror adjacent that pin head, to thereby narrow or foreshorten the image projected on that adjacent mirror portion. Conversely, when the threaded rod 28 is rotated in the opposite direction, the nut 34 will abut the inner surface of the mirror 10 at the point of contact, to push and offset that adjacent section of the mirror 10 outwardly, and render it concave, and thus serve to enlarge or broaden the portion of the image projected on that section of the mirror.

It will also be seen that the length of the pin 24, which is in excess of the thickness of the mirror 10, permits a degree of play in the rotation of the threaded rod in either direction before it is effective to deflect the mirror 10 and also allows for the angular disposition of the offset portion of the mirror on the pin 24 when the mirror section it controls is at an angle relative thereto.

It will likewise be quite obvious that since each mirror section having an opening formed therethrough is provided with individual adjusting means for offsetting that section of the mirror from its normal plane in either direction, and may be individually adjusted, independently of the other sections, into concave, convex, or neutral position, a great number of variations in the size and shape of the image of the object, or any part thereof, that is projected upon the mirror is made possible. Further, since the degree of offsetting of each individual offsettable portion of the mirror, in each direction, may be varied, within the limits provided for, still greater variation in the image distortions may be effected by the apparatus of the invention.

Each rod 28 may be provided at its other end with a stem portion 36, by which it may be supported in a bearing 38, set in bracket 40, secured on the inner face of the frame wall 16.

Each rod 28 may, if desired, be manually adjustable by the manual engagement of its stem portion 36. For that purpose, such stem may be extended through the wall 16 and provided with a suitable head, in a manner which will be readily understood and not thought necessary to be specifically illustrated.

Preferably, however, the rods 28 may each be rotated and controlled by electrical means. For that purpose, an individual, reversible motor 42, suitably connected in an electric circuit and provided with individual control means, may be provided for each of the mirror flexing units. In the illustrated embodiment, the reversible electric motor 42 is mounted on the exterior of the frame wall 16 and is provided with a shaft 46, which extends through the wall 16 and carried on its end a pinion gear 48, which slidably engages longitudinal teeth formed on the exterior of an elongated gear sleeve 50, which is internally threaded and is threadedly engaged over the portion of the rod 28 between walls 14 and 16, and is locked in place thereon by locking nuts 52, at each end thereof.

Each motor 42 is individually connected in an electric circuit, as by a cable 43, through an individual three-pole switch 54 (shown for purposes of clarity in FIG. 5 of the drawings, as two switches 54*a* and 54*b*, interconnected as at 44), that may be mounted with the switches of the other motors on a common control panel 55. Each switch 54 may be moved to selectively connect its associated motor to either a positive or negative pole of a power source, such as the secondary of a transformer 56, to selectively drive or reverse the motor for rotation in one direction or the other.

Safety means are provided in the circuit to prevent excessive movement of the rod 28 in either direction. Such safety means may comprise a safety switch 58, that is connected in the motor circuit and is engageable in a disc 60, mounted on the rod 28, which engages one of the safety switch arms to break the circuit through the motor after the arm 28 has moved a predetermined distance in either one of its two directions.

To complete the motor circuit again, there is provided a by-pass circuit having a relay 62, which is actuated by a pushbutton switch 64, to close the auxiliary switch 66, to complete an alternate circuit to the motor, upon the closing of the appropriate circuit through the switch 54.

Each of the switches 54 on the control panel 55 may be associated with a pair of signal lights 68 and 70 indicating the direction of the rotation of the associated unit motor 42 and, thus, whether the mirror section with which the unit is connected is being moved or held against the mirror to serve in an individual or combination movement for image reduction or image magnification. For that purpose, each opening 22 is provided on its outer and inner marginal edge portions with an electroconductive washer 72 and 74, respectively, which may also serve as reinforcements for the edges of the openings. The signal lights 68 and 70 are each connected to the source of power 56 by one contact and by its other contact to either one or the other of the metallic washers 72 or 74, surrounding each opening 22 in the mirror, the circuit being completed through contact of the rod 28, by head 26 or nut 34, with either one or the other of the washers 72 or 74 and through the grounding of the rod 24. Thus, when the head 26 of the pin 24 contacts the outer washer 72, the circuit is completed through one of the signal lights, as 68, whereas when the nut 34 contacts the inner washer 74, the circuit is completed through the other of the signal lights 70. It will be understood that in the foregoing arrangement, either the mirror 10 must be of dielectric material or the washers 72 and 74 must each be insulated from the mirror 10.

The reflector 10 may be of any size or shape, as may be required or desired for its purposes. Likewise, the deflector unit-engaging openings 22 may be varied in number and spacing as may seem most apt for the purpose intended. Also, to make possible the independent deflection of the several reflector sections with a minimum of stress and buckling, preferably shallow, wide-angled, dart-like indentations may be provided in the reflector edge, between all or selected of adjacent openings 22. Thus, in the illustrated embodiment of the invention, the reflector 10 is of approximately octagonal shape and indentations 76 are provided in the corner or diagonal sides of the reflector.

This completes the description of the apparatus of the present invention. It will be apparent from the description that the apparatus is capable of imparting a large combination of deflections of the several sections of the deflector, to either side of the normal plane thereof, and that each individual deflection to one side or to the other side of the normal plane of the reflector may be adjustably varied in degree, to thereby make possible a substantially infinite number and combination of image distortions by way of enlargement or diminution. It will also be apparent that the apparatus of the present invention is highly suitable for use in facial reconstruction, to make possible such facial reconstruction with relative ease and speed and with a minimum use of feature-variant photographs or transparencies. It will likewise be apparent that the apparatus of the present invention may be conveniently and effectively used for other purposes, such as amusement or in the preparation or correction of drawings and designs. It will be further apparent that such apparatus may be relatively economically produced and may be formed in compact, portable form.

It will be still further apparent that numerous modifications and variations in the variable image-reflector of the present invention may be made by anyone skilled in the art, in accordance with the principles of the invention hereinabove set forth, and without the exercise of any inventive ingenuity. I desire, therefore, to be protected for any and all such modifications and variations that

may be made within the spirit of the invention and the scope of the claims hereto appended.

I claim:

1. Apparatus of the character described, comprising a support, a resiliently flexible reflector of sheet material having a normal plane when not in a flexed state, said reflector fixedly mounted at a center point on said support, said reflector having a plurality of adjacent flexible marginal portions each individually deflectible to either side of said normal plane of said reflector independently of the adjacent flexible portions of the reflector, and individually controlled means mounted on said support for selectively independently flexing each said marginal portion to a selected fixed degree relative to said normal plane.

2. The apparatus of claim 1 wherein said adjacent marginal edge portions are defined from one another by an indentation in the edge of said reflector, each said indentation having its sides disposed at an obtuse angle to one another.

3. The apparatus of claim 1, wherein each said adjacent marginal edge portion is formed with an opening therethrough and said individually controlled deflecting means each comprises a deflecting unit mounted opposite each said opening, each said unit including a rod and means supporting said rod for selective movement toward and away from said reflector, each said rod having one end portion passing slidably through the opening opposite thereto, and having means on said end portions for selectively engaging against one or the other surface of the marginal edge portion of the opening through which it is passed, and means moving said rod selectively toward and away from said reflector.

4. The apparatus of claim 3, wherein each said rod is threaded and threaded means are provided on said support for rotationally mounting said threaded rod, and wherein each said deflecting unit includes a reversible motor connected in an electric circuit and operatively connected to said rod included in each said deflecting unit for rotating the same, each said motor circuit including switch means for reversing the direction of the said motor.

5. The apparatus of claim 4, wherein a safety switch is provided in each said motor circuit and means are provided on each said rod for opening said safety switch after moving a predetermined distance in each direction of the reciprocal movement.

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