Jan. 20, 1970 W. C. ANDERSON ET AL 3,490,226

CLOCK FACE ASSEMBLY HAVING ILLUMINATED INDICATING ELEMENTS

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FIG. 1

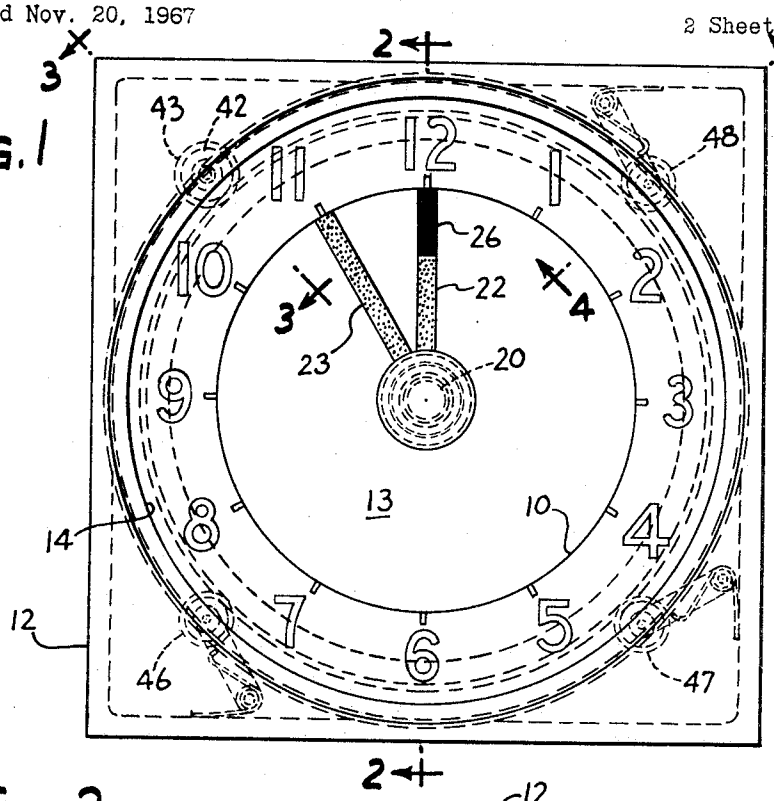
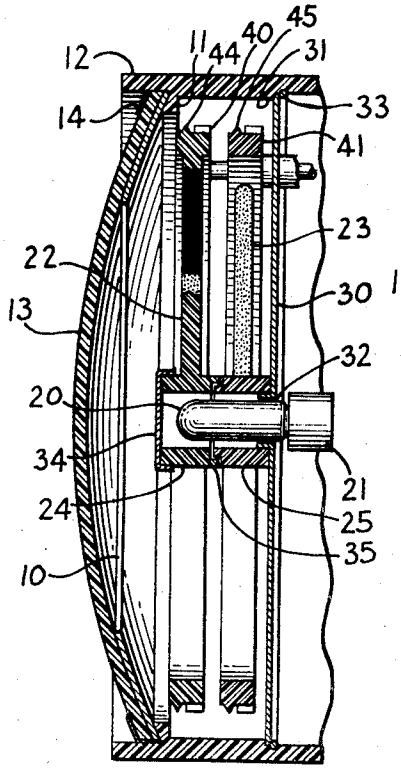


FIG. 2



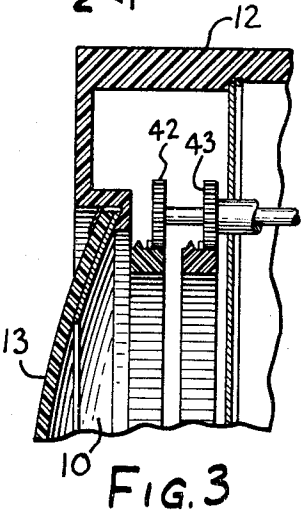


FIG. 3

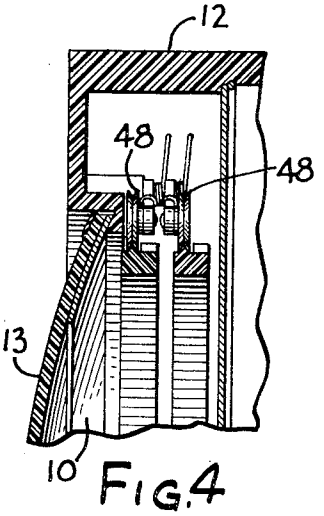


FIG. 4

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FIG. 5

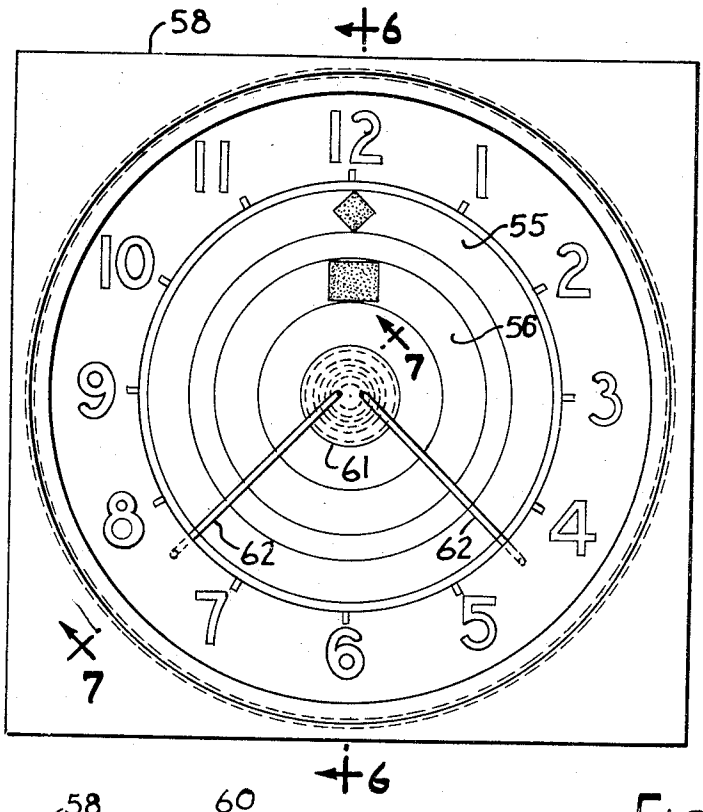


FIG. 6

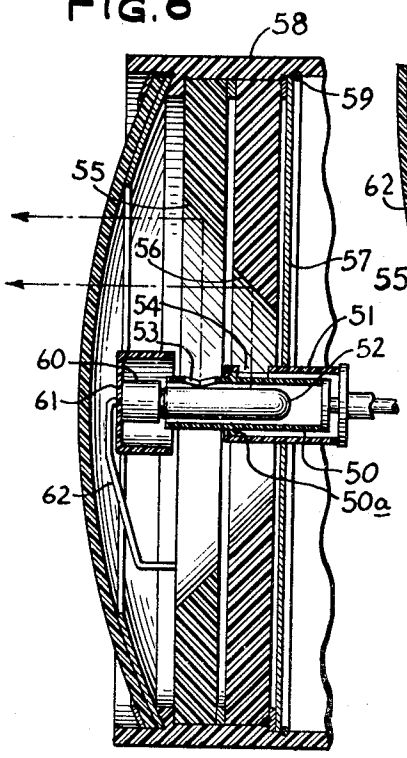


FIG. 7

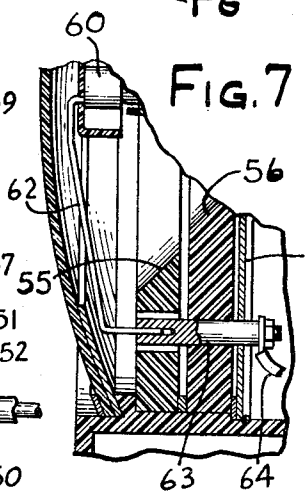
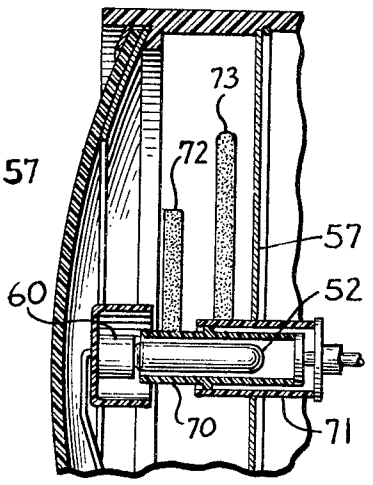


FIG. 8



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CLOCK FACE ASSEMBLY HAVING ILLUMINATED INDICATING ELEMENTS

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Int. Cl. G04b *19/30*

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ABSTRACT OF THE DISCLOSURE

A clock face assembly in which the clock hands or other time indicating elements are illuminated by a single stationary light source located at the center of the assembly. Light transmitting means are mounted for rotational movement at different controlled angular velocities around the light source while continuously transmitting light from the source either into light transmitting illuminatable clock hands, or onto light reflecting surfaces. The light transmitting means which rotate around the stationary light source are shown as being driven either from the periphery of the assembly or by a center drive. In one embodiment, the light transmitting illuminatable clock hands are formed as integral parts of light transmitting sleeves which rotate around the stationary light source. In another embodiment, two sleeves having light transmitting openings therein rotate around the stationary light source and project radial light beams onto continually changing positions on a pair of light reflecting surfaces which surround the rotating sleeves, the two light reflecting surfaces being located at two different radial positions.

This invention relates generally to timepiece display arrangements and, more particularly, to an improved clock face assembly having illuminated hands.

It is a primary object of the present invention to provide an improved clock face assembly in which the clock hands are continuously illuminated by a single stationary light source. A related object is to provide such an improved clock face assembly which utilizes a single stationary light source to illuminate the clock hands uniformly at all positions and without the production of shadows, even though the clock hands are driven at different controlled angular velocities.

A further object of the invention is to provide an improved clock face assembly of the foregoing type which provides a sharp contrast between the illuminated clock hands and the background of the display area. In this connection, it is an object of the invention to provide such a clock face assembly which gives a clear and distinct indication of the time even at substantial distances.

Still another object of the invention is to provide a clock face assembly with illuminated hands which is extremely versatile with regard to the variety of illuminative and decorative effects that can be obtained by only slight modifications of the assembly.

It is another object of the invention to provide an illuminated-hand clock face assembly of the type described above which requires only a few parts that can be economically manufactured, assembled, and maintained. A related object is to provide such a clock face assembly which is susceptible to high volume production.

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

FIGURE 1 is a front view of a clock face assembly embodying the present invention;

FIG. 2 is a vertical section taken along line 2—2 of FIG. 1;

FIG. 3 is a section taken along line 3—3 in FIG. 1;

FIG. 4 is a section taken along line 4—4 in FIG. 1;

FIG. 5 is a front view of a modified form of a clock face assembly embodying the present invention;

FIG. 6 is a vertical section taken along line 6—6 in FIG. 5;

FIG. 7 is a section taken along line 7—7 in FIG. 5; and

FIG. 8 is a partial vertical section of a further modified form of a clock face assembly embodying the present invention.

While the invention will be described in connection with certain preferred embodiments, it will be understood that it is not intended to limit the invention to these particular embodiments. On the contrary, it is intended to cover all alternatives, modifications, and equivalents as may be included within the spirit and scope of the invention.

Referring now to the drawings and turning first to FIGURES 1 through 4, there is shown a clock face assembly which includes an annular dial plate **10** having the usual hour numbers displayed thereon. The dial plate **10** rests on a circular flange **11** extending around the periphery of a circular opening formed by a casing **12** which also houses a timing mechanism (not shown) for driving hour and minute hands at the required speeds so that the time is displayed in the usual manner by the position of the hands relative to the numbers on the dial plate. In order to close the front of the opening to protect the interior of the clock from dust and the like, a transparent lens **13** is fitted against the front of the dial plate **10** and held thereagainst by means of a snap ring **14** which also serves as trim around the periphery of the lens and dial plate. The snap ring **14** is typically provided with a plurality of lugs spaced around its periphery and adapted to fit into corresponding notches formed in the casing **13**.

In accordance with the present invention, the clock face assembly includes a light source positioned at the center of the dial plate, a pair of hour and minute indicating elements made ofa light transmitting material and mounted for angular movement around the light source so as to transmit light from the source along continually changing radial paths to indicate the time, and drive means for rotating the indicating elements at different controlled angular velocities while continuously maintaining a light transmission path between the light source and the indicating elements. Thus, in the particular embodiment of the invention illustrated in FIGURES 1 through 4, a stationary light bulb **20** is mounted in the center of the clock face in a fixed socket **21** connected to an appropriate power source through the rear of the clock. The light source **20** is positioned slightly rearwardly of the dial plate **10** for purposes which will become apparent from the ensuing description.

For the purpose of indicating the time on the dial plate **10**, a pair of illuminatable clock hands **22** and **23** made of a light transmitting material extend radially outwardly from a pair of integral sleeves **24** and **25**, respectively, disposed concentrically around the light source **20**. The clock hands **22**, **23** and the integral sleeves **24**, **25** are suitably made of clear polystyrene, an acrylic resin such as "Lucite" or "Plexiglas," or any other suitable illuminatable light transmitting material. As the clock hands **22**, **23** rotate around the light source **20**, light is continuously transmitted through the sleeves **24**, **25** and on through the radially extending hands **22**, **23** so as to illuminate the hands uniformly along the entire length thereof. To make the visible portion of the hour hand **22** shorter than the minute hand **23**, the radially outer portion of the hour hand **22** is coated with an opaque material such as an

opaque black paint, as indicated at **26**, so that only the radially inner portion of the hour hand is illuminated, while the minute hand **23** is illuminated all the way out to the edge of the dial plate **10**. If desired, the opaque coating can be replaced by an appropriate light shield made of opaque material. It will be understood that the relative lengths of the visible portions of the two hands **22, 23** may be varied to any desired length by simply coating more or less of the two light transmitting rods. Also, an endless variety of different designs and illuminative effects can be achieved by simply varying the configuration of the light transmitting materials. If desired, different color effects may be obtained by simply adding a suitable pigment to the indicating elements when they are molded.

In order to make the illuminated clock hands **22, 23** distinctly visible, a dark background plate **30** is fitted against a complementally formed shoulder **31** on the inside surface of the casing **12** so as to provide a dark background against which the clock hands **22, 23** are viewed. This provides a sharp contrast between the illuminated hands and the background area of the display field. A forwardly projecting flange **32** on the inner periphery of the background plate **30** fits into the rear sleeve **25** to provide a supplemental guiding support for the time indicating elements. The background sleeve **30** is held firmly in place by means of a conventional snap ring **33** fitted within a cooperating groove formed in the casing **12** just behind the plate **30**, so that it can be quickly assembled for high volume production.

For the purpose of restricting the light transmitted from the source **20** through the sleeves **24, 25** to the particular portions of the sleeves that merge with the clock hands **22, 23**, the outside surfaces of the two sleeves **24, 25** are preferably coated with an opaque material similar to that applied to the radially outer portion of the hour hand **22**. This opaque coating prevents the diffusion of light from around the entire circumference of the two sleeves **24, 25**, so as to eliminate or minimize illumination of the background plate **30** and maintain a maximum contrast between the illuminated hands and the dark background. In addition, an opaque cap **34** is snapped over the front end of the sleeve **24** so as to conceal both the light source **20** and the sleeves **24, 25** from the viewer in front of the clock. This cap may be removable to facilitate replacement of the bulb **20**. In addition, it should be noted that the opposed ends of the two sleeves **24, 25** are preferably provided with overlapping flanges as indicated at **35** so as to provide an interlocking arrangement which helps maintain the two sleeves in alignment with each other and to strengthen the unit against mechanical shocks or vibration.

In keeping with the present invention, the two illuminated clock hands **22, 23** are driven at controlled angular velocities by a drive arrangement which does not interfere with the light transmission path between the light source **20** and the inner ends of the two hands **22, 23**. Thus, in the illustrative embodiment of FIGURES 1 through 4, a pair of ring gears **40, 41** are provided at the outer ends of the two hands **22, 23** as integral parts thereof. The two ring gears **40, 41** mesh with a pair of cooperating pinions **42, 43** connected to the timing mechanism (not shown) so that the pinion **42** drives the hour hand **22** at a controlled speed of one revolution per twelve hours, while the pinion **43** drives the minute hand **23** at a controlled speed of one revolution per hour. The pinions **42, 43** are preferably mounted in the clearance provided between one of the corners of the square casing **12** and the circular dial. Since the drive for the clock hands **22, 23** is thus located beyond the outer ends of the hands, the light transmission path between the source **20** and the inner ends of the hands is never obstructed at any angular position of the hands.

The same integral rings which form the two gears **40, 41** project forwardly from the gear teeth so as to form a pair of continuous circumferential guide beads **44, 45** which cooperate with three identical pairs of complementally formed guide wheels **46, 47** mounted within the other three corners of the casing **12**. To reduce wear on the guide beads **44, 45** and also facilitate assembling of the unit, each of the guide wheels **46, 47** is journaled on the end of a supporting arm **48** which is pivoted at its outer end on the casing **12** and biased inwardly toward the guide beads **44, 45** by means of a spring **49**. Consequently, the entire movable portion of the time indicating arrangement is supported at all four corners, with three of the support points being provided by the biased guide wheels **46, 47** and the fourth support point being provided by the drive pinions **42, 43**. The resilient supports at three of the four corners enable the unit to absorb mechanical shocks and vibration without excessive wear or breakage.

In accordance with a modified embodiment of the invention, the time indicating elements which move around the light source direct the light radially outwardly to a pair of stationary reflecting members which reflect the light forwardly toward the viewer in front of the clock lens. Thus, in the particular embodiment illustrated in FIGURES 5, 6, and 7, the drive train of the clock is connected to a pair of concentric sleeves **50** and **51** which rotate around a stationary light source **52** at speeds corresponding to those of conventional hour and minute hands. An integral flange **50***a* on the outside of the inner sleeve **50** engages the inside surface of the outer sleeve **51** to hold the forward portions of the concentric sleeves slightly spaced apart. The two sleeves **50** and **51** are provided with light transmitting openings **53** and **54**, respectively, which transmit light from the source **52** radially outwardly to a pair of beveled reflecting surfaces **55** and **56**. The surfaces **55, 56** in turn reflect the light beams from the openings **53, 54** forwardly through the clock lens, as indicated by the arrows in FIG. 6.

The two reflective surfaces **55, 56** extend continuously around the entire circumference of the sleeves **51, 52** so that as the sleeves are rotated the light beams transmitted through the sleeve openings **53, 54** move angularly over the reflective surfaces, with a constant shape defined by the configuration of the two openings **53, 54**. In the particular embodiment illustrated, the light beam indicating the minutes, i.e., the light transmitted through the inner sleeve **53**, is diamond-shaped, while the light beam indicating the hours is square, to enable the viewer to readily distinguish between the hour and minute indications. In addition, the hour indicator is spaced radially inwardly from the diamond-shaped hour indicator so that the reflected light areas seen by the viewer appear as shown in FIG. 5, with the hour-indicating area closer to the center of the face than the minute-indicating area. In order to provide a dark background for maximum contrast with the illuminated clock hands, a background plate **57** similar to the plate **30** described above is mounted behind the rear reflector element **56**. The two reflector elements are held in place against the clock casing **58** by means of the same snap ring **59** that holds the background plate **57** in place.

In accordance with one particular aspect of this invention, the light source **52** in the embodiment of FIGURES 5 through 7 is mounted in a socket **60** supported within a concealing cap **61** directly in front of the two rotating sleeves **50, 51**. The outside diameter of the cap **61** is slightly greater than the outside diameter of the outer sleeve **51** so that the sleeve stack is completely concealed from the viewer in front of the clock lens. To support the concealing cap **61** and the socket **60** mounted therein, a pair of thin supporting legs **62** mount the cap **61** on the forward reflective member **55**. One of the supporting legs **62** is hollow so as to serve as a conduit for carrying the electrical wires from the socket **60** to a contact element **63** extending back through the two reflective members (see FIGURE 7) for connection to a power line **64**. It will be appreciated that the two supporting legs **62** may be made extremely thin and may even be made of trans-

parent material so that there is practically no visible obstruction of the reflected-light time indicators as they pass the legs.

In order to transmit the light through the opening **54** in the outside sleeve **51**, that portion of the inner sleeve **50** underlying the opening **54** must be made of a transparent material. The balance of the outside surfaces of both sleeves **50** and **51** are preferably coated with an opaque material in order to prevent diffusion of light onto the background panel **57** and the portions of the reflective surfaces **55, 56** which are not directly illuminated by the light beams from the two openings **53, 54**. In addition, the interior surfaces of the two sleeves **50, 51** are preferably coated with a highly reflective material (except for the transparent portion of sleeve **50** underlying opening **54**) to increase the intensity of the light beams transmitted through two openings.

In a further embodiment of the invention, illustrated in FIGURE 8, the time indicator arrangement is similar to that of FIGS. 5–7 except that the light is transmitted directly from a pair of concentric sleeves **70, 71** into a pair of illuminatable clock hands **72, 73** made of a light transmitting material similar to that employed for the hands **22, 23** in the embodiment of FIGURES 1 through 4. In order to permit the transmission of light through the inner sleeve **70** to the minute hand **73**, that portion of sleeve **70** underlying the minute hand **73** must be transparent, although it is preferred to coat the balance of the exterior sleeve surfaces with an opaque material to minimize light diffusion as described previously. Similarly, the interior surfaces of the sleeves are preferably made reflective (except for the portion of the inside sleeve **70** underlying minute hand **73**) to intensify the light transmitted through the hands.

As can be seen from the foregoing detailed description, this invention provides an improved clock face assembly in which the clock hands are continuously illuminated by a single stationary light source located at the center of the assembly. The clock hands are uniformly illuminated at all positions without the production of shadows, and with a sharp contrast between the illuminated hands and the background of the display area so as to give a clear and distinct indication of the time even at substantial distances from the clock. The assembly is extremely versatile in that a variety of illuminative and decorative effects can be obtained by only slight modifications. Moreover, the assembly can be economically manufactured from only a relatively small number of parts, and is readily susceptible of high volume production.

We claim:

1. A clock face assembly comprising the combination of a dial plate having time indicia thereon, a stationary light source positioned at the center of said dial plate, a pair of illuminatable clock hands made of a light transmitting material and mounted for angular movement around said light source, the radially inner ends of said clock hands being joined with a pair of sleeves which are mounted for rotation around said stationary light source, said sleeves being adapted to continuously transmit light directly from said source to the inner ends of said hands and radially through said hands for illuminating the hands, and means operatively connected to the radially outer ends of said hands for driving said clock hands at different controlled angular velocities while continuously maintaining a light transmission path between said radially inner ends of said hands and said light source.

2. In a clock, a clock face assembly comprising the combination of a centrally located stationary light source, a pair of ring gears disposed concentrically around said light source and spaced radially therefrom, driving means operatively connected to said ring gears for rotating a first one of the ring gears at the speed of an hour hand and rotating the second ring gear at the speed of a minute hand, and a pair of radially extending clock hands made of a light transmitting material, said clock hands being secured at their outer ends to said ring gears and extending radially inwardly toward said light source so that the light from said source is transmitted radially through said clock hands to illuminate the same regardless of the circumferential position of the hands relative to said source or to each other.

3. A clock face assembly comprising the combination of a clock dial having time indicia thereon, a stationary light source located at the center of the dial, a pair of annular light reflecting surfaces surrounding said stationary light source, said surfaces being radially and axially offset from each other, a pair of time indicating elements mounted for angular movement around said light source and adapted to direct light beams onto said reflecting surfaces, and means for driving said light transmitting elements at different controlled angular velocities corresponding to the velocities of hour and minute hands so as to move the light beams around said reflecting surfaces at said velocities to indicate the time.

4. A clock face assembly as defined in claim **3** wherein said time indicating elements comprise a pair of sleeves surrounding said light source and forming light transmitting openings for directing said light beams onto said reflecting surfaces.

References Cited

UNITED STATES PATENTS

2,009,209	3/1932	Scantlebury	58—50
2,290,278	7/1942	Failla	58—50

FOREIGN PATENTS

160,209	7/1954	Australia.
627,246	2/1936	Germany.
732,788	9/1932	France.

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58—23; 240—6.43