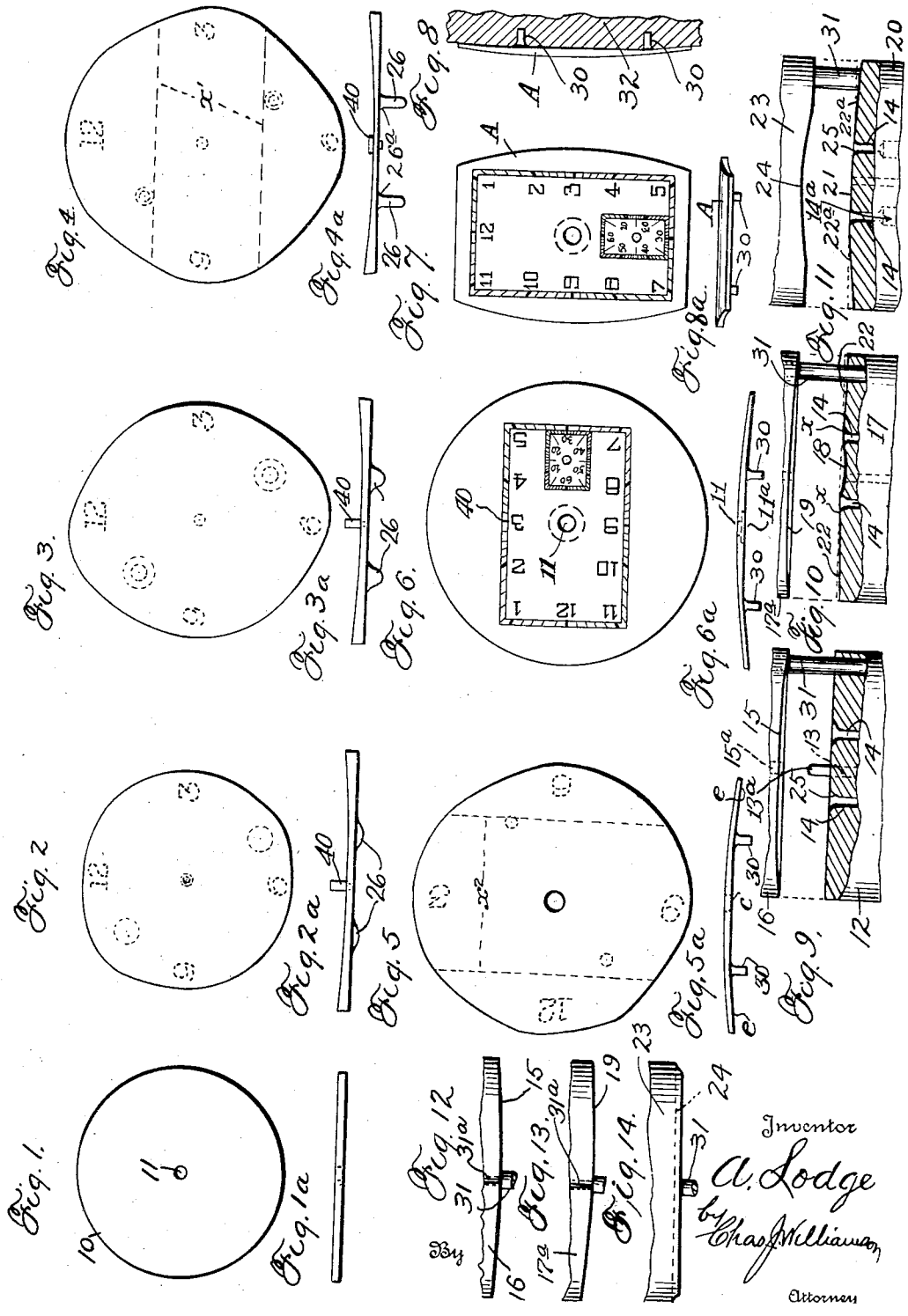
Dec. 28, 1937. A. LODGE 2,103,263

DIAL FOR WATCHES AND OTHER INSTRUMENTS

Filed May 15, 1935



Patented Dec. 28, 1937 2,103,263

UNITED STATES PATENT OFFICE

2,103,263

DIAL FOR WATCHES AND OTHER INSTRUMENTS

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Application May 15, 1935, Serial No. 21,622

4 Claims. (Cl. 58—127)

The present invention relates to a watch dial having integral projections therefrom while, at the same time, having a smooth unblemished surface on its opposite side or dial surface within the area from which said projections extend.

Watch dials are attached to a pillar plate by several spaced apart feet inserted in holes for the respective feet in the pillar plate and therein secured. It has always been the practice, until the production of my invention about to be set forth, to provide separate feet or pins and attach them to the metal backing plate of the dial usually by soldering the feet at one end in holes provided in the metal plate for that purpose. In itself, although so long persisted in, the procedure just described is subject to certain disadvantages (1) the inability to obtain accurate alignment of the feet; (2) when the feet are applied to dials which are to be covered with a thin layer of enamel or other plating, the solder becomes dislodged and the feet become loose or lost; (3) when the dial is covered or plated with a suitable dial facing material, the heat of the solder frequently mars the dial face; (4) in curved dials the recesses or holes provided for their positioning by drilling frequently come through the opposite face of the dial due to the fact that these recesses must be drilled at a sloping angle with respect to the surface of the dial. Modern watches, furthermore, have created problems of construction or manufacture which not only seriously increase the disadvantage of the just described hitherto followed practice but in some special cases make impossible such procedure. This is notably true in the so-called wrist or strap watches so universally worn.

The principal object of my invention has been the solution of the problems, thus created, in a way that will be wholly satisfactory from the standpoints of manufacture and the watch product itself. A particular object of my invention is to solve such problems in connection with the strap or wrist watch and especially with such a watch having a concave curvature on the side thereof next to the wrist of the wearer. In solving the problems, I have produced both a method for the manufacture of watch dials which is new (claimed in my co-pending application Serial No. 94,295) and a new dial. A distinctive feature of the invention is an integral formation of metal dial plate and feet, so that dial and feet are a single unit, the feet being composed of metal extruded from the plate, and, of course, without holes therein for the feet. The feet of my dial are integral with the plate and merge into the same, leaving the plate solid in every direction around each foot, as distinguished from dials which might be provided with feet stamped out of the dial plate and bent back from the same to form supports, thus leaving a hole in the dial plate on one side of each foot which is objectional for watch dials.

Heretofore, feet or pins have been extruded from the stock of metal blanks used for producing dial face numerals (such as disclosed in the patent to Jeremiah McGrevy No. 1,632,305 granted June 14, 1927), these feet being elongated projections from the underface of the blank and receivable in openings of very small diameter disposed about the marginal or peripheral edge of a watch dial face. However, in the case of dial face numerals, the diameter of the blank from which they are made is usually about 20 times the thickness of this blank; and the diameter of the feet or pins extruded from the blank is not more than substantially 1 to 1 relative to the thickness of the blank. On the other hand, in the manufacture of dials, the diameter of the dial may range from 50 to 150 times the thickness of the blank (and more); and the feet required for the dial, to be received in proper openings in the pillar plate, have a thickness or diameter of the order of substantially 2 to 4 times larger than the thickness of the dial plate. The McGrevy process, while found satisfactory for the production of dial numerals having feet extruded therefrom without causing any blemish on the outer face of the numeral blank, was found entirely inadequate for providing dials having such extruded feet and without blemishes on the dial face, it appearing that the thickness of the stock in relation to the diameter of the feet caused the metal to act differently in the two instances, particularly so when feet or pins of greater diameter than the thickness of the blank is required to be extruded from the blanks. In the last mentioned instance it was found that the stock of the blank no longer acts like a viscous fluid under pressure, as in the case of the numerals, but is more or less folded down into the openings in the dies for forming the feet leaving depressions on the outer or dial face of the blank. Thus it is apparent that the disclosure of the McGrevy patent is not operable for the production of watch dials and does not disclose a watch dial as contemplated by this invention. My invention consists in whatever is described by or is included within the terms or scope of the appended claims.

Inasmuch as my invention has been developed, as I have explained, in connection with the

curved type of wrist or strap watch, it will facilitate illustration and description of my invention in its broad aspect as well as that particular application of it, to show in the drawing, illustrations of a watch dial of that description and the method or procedure in producing such a dial.

In the accompanying drawing:

Figs. 1 to 7 are, respectively, illustrations in plan view of the changing form from blank to completed dial; and

Figs. 1*a* to 6*a* are, respectively edge views thereof;

Fig. 8 is an edge view of the dial applied to the pillar plate shown in section;

Fig. 8*a* is an end view of such dial;

Figs. 9 to 11 are, respectively, views of upper and lower dies employed in producing the changes in the blank as shown in Figs. 1 to 5, portions of the lower die being in section through the holes into which the feet are extruded. The dies for performing the operations illustrated in Figs. 2 and 3 are substantially those shown in Fig. 9 and the blanks shown in Figs. 2, 2*a*, 3, 3*a*, 4, and 4*a*, are illustrated in the drawing in a position of about 90 degrees from that which they assume in the dies of Figs. 9 and 10, as shown in the drawing.

Figs. 12, 13, and 14 are, respectively, views of the upper dies shown in Figs. 9 to 11, seen from a point at right hand side of Figs. 9, 10, and 11.

Inasmuch as the embodiment of my invention, selected for illustration and description, is the dial for a curved wrist watch, a brief preliminary description appears desirable. The dial A shown in Figs. 7, 8, and 8*a* of the drawing, is of an oblong form with the greater dimension or length in the line of the opposite dial numerals 6 and 12, the curvature being in that direction. The dial shown is one where the numerals are engraved or impressed in the outer surface of the plate, that surface having a thin plating of silver, for example. The outer surface is convexly cylindrically curved from end to end, and the under surface, or that one next to the pillar plate, is concavely dished in the same direction, the plate being thinned down towards each end with the central or intermediate portion substantially thickened and the central or intermediate portion is flattened so that it will lie flat against the adjacent flat upper surface of the pillar plate (see Figs. 5*a*, 6*a*, and 8). The integral feet are situated respectively nearer the ends or 6 and 12 o'clock edges and they are located of necessity at the edges of the plate for obtaining the greatest possible accuracy in the positioning of the dial. The location of the projections or feet of watch dials must be such as to insure accuracy in disposition on the watch movement, which in turn insures accuracy of time, and to avoid interference with other parts of the watch. Thus in the curved dial, shown in the drawing, the projections or feet are located at portions of the dial which, due to its shaping, are too thin for the attachment of separate feet or pins by soldering their ends in recesses drilled into one face of the dial.

The curvature of a dial for watches as well as other small instruments, is desirable for the sake of appearance and also for the practical reason of providing clearance for adjacent parts of the instrument.

Heretofore there were two methods commonly employed to provide such dials. One method was to bend or curve or shape the dial by the hands or by tools or dies so that even though the opposite sides or surfaces were curved, the thickness of the dial throughout remained approximately the same. The other method involved the addition or removal of material from either the face or the back of the dial to produce the necessary shape. By both of these procedures, the thickness of the dial varies and feet may be applied either before or after either operation, but this results in inaccurate disposition of the feet due to displacement after bending, if applied prior thereto, but if applied after forming, the feet must be attached to sloping surfaces which cause the feet to extend at improper angles for reception in the openings provided therefor in the pillar plate of the watch; or, if the usual recess for attaching the feet is drilled in the thin dial to facilitate attachment of the feet to align with the pillar plate openings, the recess will be at such an angle with respect to the sloping surfaces of the dial that a portion of it will come through the opposite side of the plate, thus marring it and rendering attachment difficult.

In positioning the dial on the pillar plate, it is essential to the accuracy of the time keeping properties of the watch that the feet shall be parallel and so located as to fit nicely in the openings of the pillar plate, and accordingly accuracy of alignment and positioning of the feet on the dial plate are essential. This accuracy is attainable by my method which forms the dial and the feet thereon simultaneously, or as parts of one continuous operation, with the feet or projections in proper position thereon, but is not possible by such methods as I have described involving bending or machining or by separate feet or pins soldered or otherwise attached to the dial plate.

The blank **10** to be transformed into the dial is a thin disc of metal of uniform thickness, either solid metal or with a thin plating, such as silver or the like, having a central hole **11**. The dies, shown in Figs. 9 to 14, may be employed to fashion the blanks. Accordingly, the dies are conveniently made in the form of cylindrical blocks, each die being mounted on a suitable holder not necessary to show or describe.

The blank **10**, in Fig. 1, is first subjected to operation of the dies **12** and **16** in Fig. 9, where it will be seen that the lower die **12** has a flat or plane upper face and extending downward therefrom is a central hole **13** and two eccentric holes **14**, shown 180° apart in the case illustrated, for the flow of metal from the blank for the formation of the feet, while the lower and cooperating face **15** of the upper die **16** is cylindrically convexly curved. The action of these dies on the blank gives the blank the form shown in Figs. 2 and 2*a*.

The first operation reduces the thickness of the blank through the center forcing the metal out to the sides of the blank, thus leaving the side marginal portions thicker than the center portion. As the metal is flowed or shifted from the center toward the sides, the flow forces the metal down into the openings **14** for providing the rudimentary projections **26** from which the feet **30** (Figs. 8 and 8*a*) are eventually formed.

The development of the blank, as shown in Figs. 3 and 3*a*, is produced by subjecting the blank, shown in Figs. 2 and 2*a*, to a further operation of dies similar in all respects to those in Fig.

9, except that the cooperating surface of the upper dies has a greater curvature in order to further force the metal toward the sides of the blank to additionally thin it in the center and to add metal to the rudimentary projections **26**, the openings **14** being enlarged for this purpose.

In these figures it will be observed that the blank has been thinned at its central portion to a greater extent than it has at its marginal portions. Projecting from the central hole or opening **13** in the die **12** is a guide pin **13***a* which is received by the central hole or opening **11** in blank **10**, and holds the blank in place during the initial die operation. During the initial operation rudimentary feet **26** shown in Fig. 2*a*, are formed on the blank, and which rudimentary feet later become the feet **30**. In subsequent die operations these feet serve as guides for the blank, thus dispensing with the necessity of pin **13***a*.

In Figure 10, lower die **17**, for producing the development of the blank, shown in Figs. 4 and 4*a*, has its upper operating face with a concavely cylindrical depression **18**, at the central portion thereof, the theoretical axis of the curvature being in the direction substantially at right angles to the axis of the curvature of the dies shown in Fig. 9, (and, in respect to the dial shown, in the direction of the 3 to 9 o'clock edges of the dial). Such curvature **18** may, but not necessarily, terminate at each side in line with one of the foot-forming holes **14** and, from that point outward to the periphery of the die **17**, the surface **22** inclines downward at a slight angle while the working face of the upper die **17***a* has a cylindrically convex face **19** (similar to die **16**, Fig. 9), extending to the periphery of the face. The action of the dies **17** and **17***a*, by reason of the surface **22**, slightly bends the under surface of the blank for curved dials at opposite marginal side portions thereof (preferably at its 6 and 12 o'clock numeraled portions) substantially along the dotted lines x', as shown in Fig. 4. The depression **18** is for the purpose of causing metal to flow toward the center of the blank from portions lying opposite the humps or raised portions x (provided on the die **17** by the depression **18** and surface **22**). This operation causes the metal to shift or flow and replaces certain of the metal squeezed in the preceding operations from the center of the blank to the side thereof.

To produce the development shown in Fig. 5, the dies in Fig. 11 are employed which may be such as are suitable for the shaping desired. For the dial herein disclosed, the lower die **20** has a central flat surface **21**, instead of the concave surface shown in Fig. 10, and the angle of the adjacent downwardly inclined surfaces **22***a* is somewhat greater than the surface **22** in Fig. 10; and the upper die **23**, shown in Figs. 11 and 14, has on its lower working face a cylindrically concavely curved depression **24**. The width of the depression **24**, extending from left to right in Fig. 11, corresponds to the length of the finished dial (from 12 to 6 o'clock numbers) while the axis of the depression extending from left to right in Fig. 14 (taken at right angles to the view in Fig. 11), runs along the 3 to 9 numerals on the dial. The dotted lines x^2, in Fig. 5, substantially indicate lines on which the under surface of the blank is bent or offset by the dies **20** and **23** (preferably at the 6 and 12 o'clock numeraled portions of the dial).

It will be observed that the holes **14** into which the metal flows, or is extruded during the swaging operations, have each at the entrance an enlargement with convexly rounded surfaces **25**, that produce the fillet **26***a*, at the junction of the foot **26** with the dial plate, and that the radius of curvature of that convex surface is gradually diminished in the successive operations produced by the lower dies **12**, **17**, and **20**, and that diminution of radius is carried to the next die (not shown in the drawing) for producing the track **40** and which is used in the next to the last operation wherein the tracks, minutes and seconds designations and numerals are impressed in or placed on the dial face. In the track impressing operation the diminution of radius causes additional pressure to be applied above the feet-forming holes to compensate for any possible inaccuracy in the dies.

At the same time the track and numerals are impressed upon the face of the dial a circular depression **11***a* may be impressed into the underneath side of the dial for a purpose to be next described. The results of the dial impressing operation is the development shown in Figs. 6 and 6*a*, and in that stage, it is of circular or disc form with the perfectly formed and parallel integral feet **30**, and with a circular central depression **11***a* concentric with the central hole **11**, and with the thickened central portion having tapering margins at the 6 and 12 o'clock edges of the finished dial. The central hole **11** in the finished dial receives the hand arbours (not shown) which pass through the same, while the depression **11***a* in the underneath surface of the dial accommodates the usual collars on these arbours. The last operation is the trimming off of the marginal portions of the disc shown in Fig. 6, so that the final product is that shown in Fig. 7,—a dial of oblong form with the longer side edges slightly curved outward.

The central hole **11** may or may not be provided in the blank **10**. When so provided it enables flow of the metal towards the center, where it is most desirable to remove metal and thereby reduce the pressure which tends to distort the dies that are used further along in the process after that effect for which the hole is provided takes place. The first die operation closes the hole **11** and actually forms a burr **40** on the upper side of the dial blank as shown in Fig. 2*a* and also forces some of the metal which originally surrounded the hole into the die holes **14** provided also for allowing the metal to flow away. The burr is formed by the flow of the metal of the blank toward the center thereof and into opening **15***a* in the upper die **15** in Fig. 9, die pin **13***a* having been previously removed as being no longer necessary, due to the presence of the rudimentary feet **26***a* which now act as guides. Subsequently, the burr is removed and the hole **11** reopened, as will be explained hereinafter. Every effort is made in the early stages of the process to remove metal from the center of the blank to avoid the building up of such a high pressure at that point in the later operations where distortion of dies due to uneven pressure is objectionable. After the central hole has been closed by the pressure of the first dies, it is reopened by drilling to remove the stock squeezed to the center. Of course it will be understood that central hole **11** is partially closed and some burr formation is produced in subsequent die operations as is clearly shown in Figs. 3*a* and 4*a*. After each die operation the burr is removed and hole **11** reopened. Such central hole is finally reopened by a die or drill to accommodate the hands-carrying arbors, such reopening being

at the same time the blank as shown in Figs. 6 and 6*a*, is trimmed to provide the dial shown in Fig. 7.

The die face formations, shown in Figs. 9 and 10, were the result of problems that arose in the use of other formations, before those formations were produced, which die face formations resulted in deformations of the blank which were chargeable to the elasticity of the metal from which the dies were made and which resulted in a higher pressure at certain points and with no direction for the metal under pressure to flow that would prevent that action on the dies, resulting in the dial being thicker at the central portion that at the 9 and 3 o'clock edges. By the preliminary operations which the dies, shown in Figs. 9 and 10, perform, the metal in the intermediate stages is flowed and shifted to positions where the pressure exerted in the final swaging operation will be almost equal over the surface of the dial and any distortion of the dies which may occur will be even and without any objectionable result because the contour of the finished dial, even though the entire surface may be depressed slightly, will nevertheless be satisfactory.

The radius of the convex face of the upper die shown in Figs. 9 and 12 is less than that of the upper die shown in Figs. 10 and 13, the curvature of greater radius tending to flow the metal to the side a little further than the curvature of less radius.

A pin **31** engaging aligning holes in the upper and lower dies situated at the 6 o'clock end of the dies secures and maintains the alinement of the dies during operation. The aligning holes in the upper die are slotted to the periphery of the same as shown at **31***a* in Figs. 12 and 13 in order to afford the aligning pin **31** a snug, slightly expanding fit.

The gradual evolution or development of the feet is shown beginning with the rudimentary form **25***a* shown in Fig. 2*a* through Fig. 8, the perfected form appearing in Figs. 8 and 8*a*.

It is very important that at least the central portion of the dial be not spaced on its underside from the pillar plate **32**, (see Fig. 8), and should lie snugly thereagainst because of the danger of cracking or otherwise injuring the dial by pressure thereon from the hand removing tools, when the hands are to be removed, such tool being thrust between the face of the dial and the hands at the center arbor.

It is to be understood that wherever in the specification and claims of this patent the watch face, plate, and feet are said to be integral or of one piece of metal, these terms are used to mean that these members are formed from a single piece of metal as distinguished from members made separately and united with solder, by threading, etc. That is to say, the watch face, plate and the feet are integral in the sense that members are integral when they are pressed from a single sheet of stock or cast in a single casting.

What I claim is:

1. A dial for watches consisting of a metal plate with feet on the side opposite the dial face that are texturally integral with the plate, the portion of the plate from which they project being solid in every direction around each foot, said dial and feet being a unit, the face of the dial being convexly curved and free of blemish above said feet, the plate being thickest at its central portion and the thickness reducing towards opposite edges, and the feet being located at the thinner portions of the plate and being of greater diameter than the thickness of said thinner portions of the plate from which they extend.

2. As a new article of manufacture, a dial for watches comprising a metal dial plate of a thickness suitable for dials and one surface of which provides the dial face, feet projecting from the opposite surface of the said plate to be received in the usual openings in the pillar plate of a watch and of a diameter greater than the thickness of the plate, said feet being texturally homogeneous with the dial plate, and the portions of the dial plate from which the feet project being solid in every direction around each foot and the dial face being smooth and free of indentations therefrom.

3. As a new article of manufacture, a dial for watches comprising a metal dial plate of a thickness suitable for dials and one surface of which provides the dial face, supporting projections extruded from the stock of the dial plate on the opposite surface thereof to be received in the usual openings in the pillar plate of a watch, the portions of the dial plate from which said supporting projections extend being of less thickness than the diameter of said projections and being solid in every direction around each projection and the dial face overlying each projection being smooth, homogeneous and free of indentations therefrom.

4. As a new article of manufacture, a dial for watches comprising a metal dial plate having varying thickness in the different portions of its area suitable for dials and one surface of which provides the dial face, feet projecting from the opposite surface of the said plate and from the thinner portions thereof to be received in the usual openings in the pillar plate of a watch and being texturally homogeneous with the dial plate, the portions of the dial plate from which the feet project being solid in every direction around each foot and of greater diameter than said portions of the dial plate from which they project, and the dial face being smooth and free of indentations therefrom.

ALVIN LODGE.