Jan. 9, 1940. F. E. DUTCHER 2,186,451

METHOD OF INSTALLING UNBREAKABLE WATCH CRYSTALS

Filed Nov. 20, 1937 2 Sheets-Sheet 1

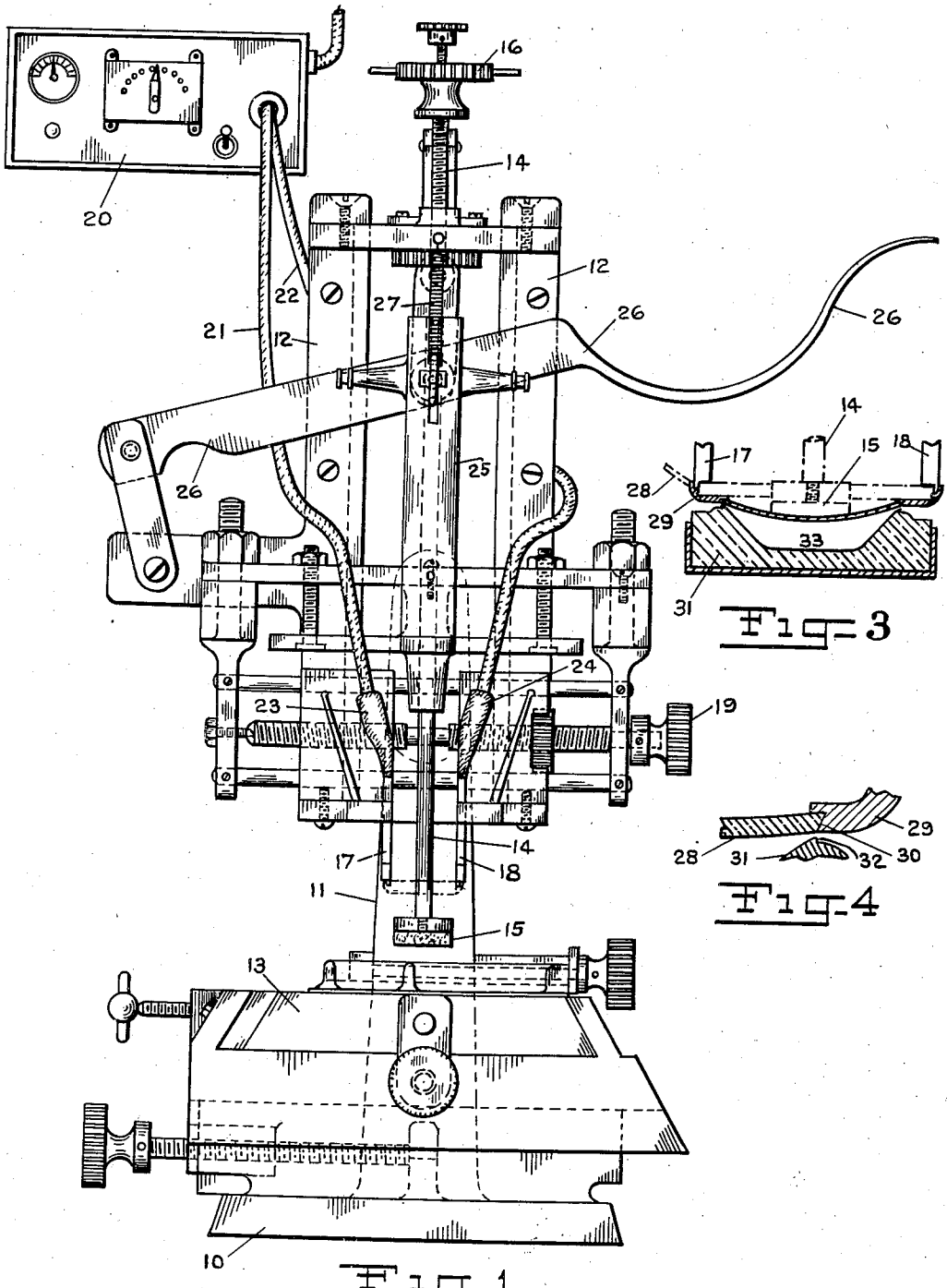


Fig. 1

Fig. 3

Fig. 4

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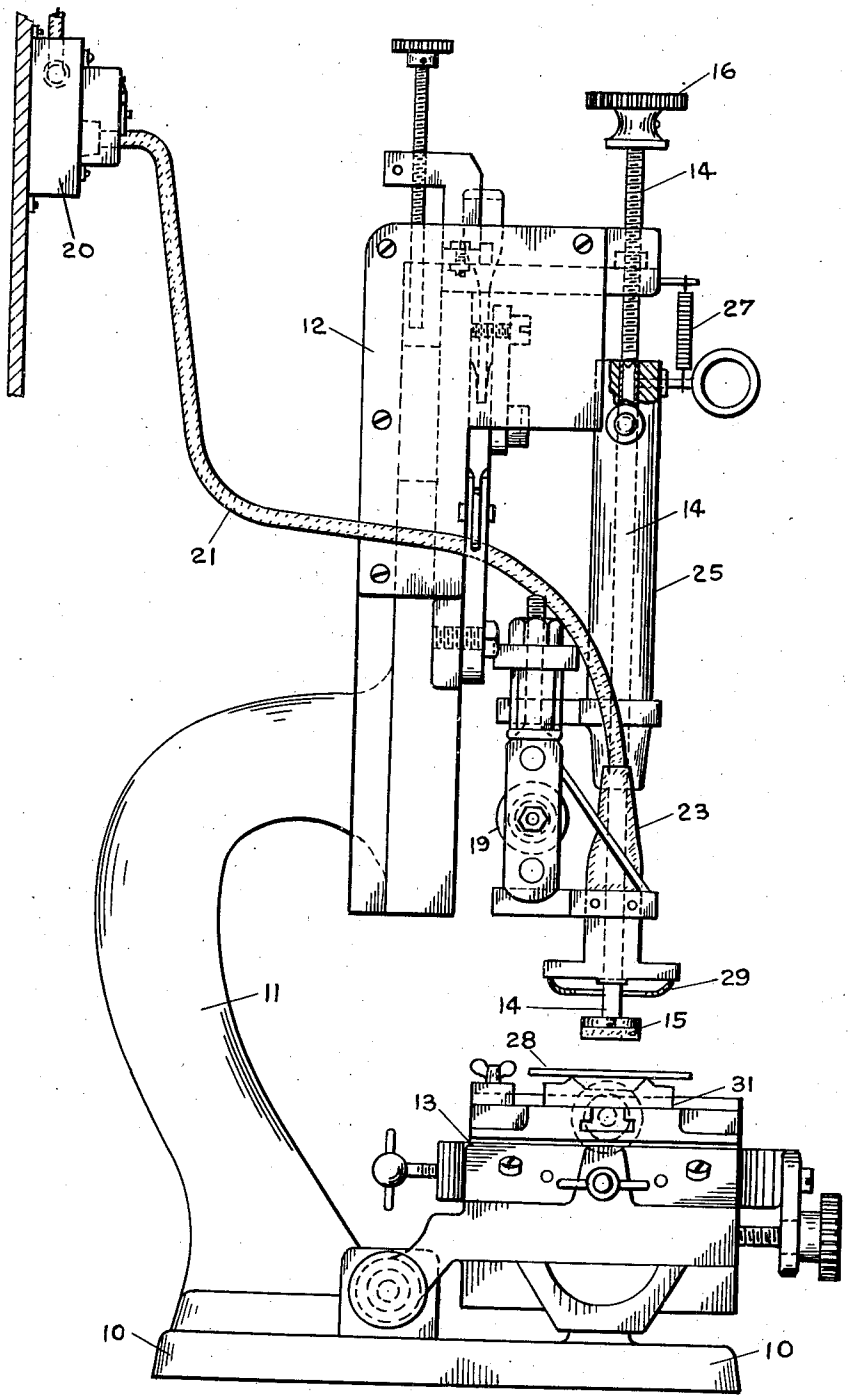


Fig. 2

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Patented Jan. 9, 1940 2,186,451

UNITED STATES PATENT OFFICE

2,186,451

METHOD OF INSTALLING UNBREAKABLE WATCH CRYSTALS

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Application November 20, 1937, Serial No. 175,561

6 Claims. (Cl. 18—59)

This invention relates to an improved method of installing thermoplastic unbreakable watch crystals in the bezels of the bezel cases employed on the many varied geometrical form of watch-cases currently manufactured.

One of the important objects of the present invention is to provide an apparatus which functions to obtain a perfect peripherally fused fit of the unbreakable crystal forming material in the bezel of any type bezel case.

Another object of the invention is to employ the elastic quality of the pliable material forming the unbreakable crystal to insure permanency of the fit of the set crystal.

A major object of the invention is in the provision of a device adapted to melt the pliable crystal forming material to obtain a perfect bond of the same in the bezel without destroying the resiliency of the main body portion of the crystal.

A further important object of the invention is to construct a device of this character which is adapted to shape or cut the crystal material and also set the same in position in a single operation thereby very considerably hastening the time required for accomplishing the mounting of the crystal.

Still another object is to insure a perfect bond of crystal and bezel by releasing in a small degree the pressure under which the bowed material has been placed while the melting operation is being performed with relation to the limited circumferentially exposed area of the material. By this slight release in pressure the molten rim of the crystal material is effectively forced into all parts of the bezel due to the tendency on the part of the material to return to its original unbowed condition.

Another object is to employ the watch bezel case in which the crystal material is to be installed as the cutting or piercing agent for shaping the material peripherally and directly fusing the same in the bezel thereon.

My invention includes other objects and advantages hereinafter more particularly set forth in connection with the detailed description of the same with relation to the accompanying drawings. It will be understood that the drawings are merely illustrative of a single mechanical embodiment of an apparatus capable of carrying out the provisions of the invention.

Referring to the drawings:

Fig. 1 is a front elevation of the device constructed to carry out the teachings of the present invention,

Fig. 2 is a side elevation of the apparatus shown in Fig. 1, the position of the crystal forming material being clearly indicated therein,

Fig. 3 is an enlarged detail vertical cross section showing the relative positions of the mold, bezel case and crystal forming material during the cutting step of the operation of the apparatus, and

Fig. 4 is a further enlarged vertical cross section showing the manner in which the fused crystal material is gripped in the bezel of the bezel case.

In carrying out the inventive concepts of the herein disclosed subject matter, the illustrative embodiment of the same indicated in the drawings shows an apparatus which includes a base member designated at 10, an extending arm 11 and a vertically spaced supporting structure 12 adapted to retain the working parts of the device in adjustable relationship to the base. Suitably connected to the base 10 is a further adjustable supporting structure 13 upon which a mold hereinafter more particularly described is adapted to be removably secured in a fixed position by the operator of the apparatus. It will be understood that any desirable construction for accomplishing the proper vertical alignment of the mold and the other working parts of the device may be utilized without departing from the disclosed inventive concepts. The correct position of the mold on the supporting member 13 for the particular bezel case employed is clearly shown in Fig. 2 of the drawings.

The apparatus illustrated for carrying out the described method of installing watch crystals further discloses suitable bowing mechanism for doming the material forming the crystal when necessary in the watch structure. This means is provided for by the screw threaded vertically extending rod 14, one end of which has a resilient round abutting piece 15 which is adapted to contact the material forming the unbreakable crystal. The opposite end of the rod 14 includes a thumb screw 16 through which the operator of the device may set the abutting piece to obtain the necessary or required dome in the crystal forming material by direct application of pressure.

The apparatus also includes a means in its structural formation for gripping the bezel cases of the watches into which the crystal is to be directly inserted. This construction provides adjustable gripping fingers 17 and 18, Fig. 1, controlled by the operator through thumb screw 19. By varying the width of the gripping element or fingers 17 and 18 the same may be brought into

contact with the interior flange of any practically sized bezel case so as to securely position the same thereon. The position of the gripping fingers with relation to the particular bezel case employed in the present instance is clearly shown in Fig. 3 of the drawings. A suitable heat controlling electrical unit 20 which is adapted to provide means for heating the positioned bezel case contacts the bezel case gripping fingers 17 and 18 through lead wires 21 and 22. Insulators 23 and 24 are provided to separate the electrical circuit forming the bezel heating means provided in the device from the remainder of the apparatus. A hand operated lever mechanism is also included in the construction to permit the operator to regulate the vertical motion of the movable gripping fingers 17 and 18. The means portion of the device through which pressure may be exerted by the operator to move the gripped bezel case against the crystal forming material includes a slide piece 25 and the hand lever connected thereto designated at 26. A spring 27 normally maintains the hand operated lever mechanism for the bezel case gripping means in a raised position.

The thermoplastic unbreakable material from which the crystal is formed is designated in the drawings at 28.

It will be understood that the invention is employed to accomplish the direct insertion of unbreakable crystal material in practically any shape or size of bezel case. Consequently it will be appreciated that the particular construction of the bezel case does not form an important part of the present inventive disclosure. The bezel case utilized in this instance as shown in the drawings is of the usual construction being designated at 29, the bezel or crystal retaining groove of the same being indicated at 30, Fig. 4. The geometrical contour of the bezel or bezel case is immaterial inasmuch as the crystal may be installed with equal facility therein regardless of the same. The material forming the crystal is known in the art as "unbreakable" crystal and is consequently so designated throughout this specification.

The plastic mold hereinbefore referred to is indicated in the drawings at 31.

In installing the unbreakable watch crystal directly in the bezel case of the watch, the method of operation of the herein disclosed apparatus is as follows:

The bezel case of the watch is first removed from the watchcase and the same is adjusted in a downwardly facing position between the raised gripping fingers 17 and 18. The fingers grip the internal flange of the bezel case, Fig. 3, and securely set the same in position. The bezel case is fixed to be substantially centrally located regardless of its geometrical shape with relation to the vertical rod 14 which extends below the same which is clearly indicated in Fig. 1. A mold of any suitable hardening plastic material having a high area or raised portion substantially corresponding to the shape of the bezel is fixed in position in the supporting structure 13 directly below the bezel case, Fig. 2. While the plastic material forming the mold is soft, the operator of the device lowers the bezel case through movement of the lever 26 to take a light impression of the lip or rim of the bezel of the bezel case to be fitted. The peripheral impression of the bezel rim is designated in the drawings at 32 the same extending around the entire circumference of the bezel to be fitted regardless of its shape. The fixed bezel case is then raised by the operator to its normal position, Fig. 1, and the mold on both sides of the raised impression is hollowed out and made smooth as shown in Fig. 3. The central portion of the mold is cored out or hollowed as shown at 33 to allow the operator to bow the material forming the crystal if it is desired to do so which is usually the case. It will be understood that the raised portion of the mold has consequently been shaped to correspond to the bezel of the watch in which the crystal is to be fitted.

The mold 31 is allowed to harden and the installing step of the process then takes place which is as follows:

A thickness or blank of the unbreakable material forming the crystal is placed over the raised impression on the mold as indicated in Fig. 2, the same resting on this portion of the mold which corresponds in shape to the bezel. As a general rule in order to provide sufficient clearance for the hands of the watch the crystal forming material must be domed or bowed to a considerable or required extent. To accomplish this function the operator turns thumb screw 16 until the resilient abutting piece 15 is brought in central contact with the material 28. Pressure is then applied by the operator through the thumb screw until the material has been domed sufficiently to meet the requirements of the individual case, the position of the same shown being indicated by the dotted lines in Fig. 3.

The operator next utilizes the bezel case of the watch as a piercing or cutting instrument by means of which the crystal material is cut in the shape of the bezel and fitted therein in a single operation. In accomplishing this function the operator rests the bezel case upon the surface of the bowed unbreakable material 28 and heats through operation of the electrical unit 20 the bezel case until it bites or melts through the material, the temperature of the case being raised sufficiently high to accomplish this purpose. By application of the heat in the bezel case and pressure upon the material by the operator through lever 26, this step in the procedure is rapidly accomplished in order not to effect the main body of the crystal material by heat and thus cause it to lose its elastic qualities. In this manner the bezel case of the watch is employed to cut a thickness of material to conform to the peripheral shape of the bezel in which it is adapted to fit and in which it solidifies into position. The fused material fills the bezel 30 and conforms itself to all of the irregular edges therein, Fig. 4, to thereby assure a perfect fit.

In order to be positive that the peripherally cut area of the unbreakable material fills the bezel of the watch, the operator releases by approximately a quarter turn the thumb screw 16 to slightly relieve the perssure under which the material is positioned. Through its tendency to return to a normal flat surface the bowed crystal material presses the molten peripherally cut rim of the same into any portion of the bezel which it might have accidentally failed to contact. The crystal material is then quickly cooled in any suitable manner as by applying water to the positioned bezel case, the heating unit 20 being turned off by the operator, and the installing operation is completed. The bezel case is removed from the fingers 17 and 18 and the crystal set therein is cleaned for mounting upon the watchcase. It will be apparent that because of the retention of the resiliency of the main body

of the crystal material, that it will continually exert a circumferential pressure against the bezel of the bezel case to assure the permanency of the fit.

Furthermore inasmuch as the rim or lip of the material solidifies in position in the bezel it will be clear that the same conforms in shape to any roughened irregularities in the groove as shown in Fig. 4. Also it will be now understood that the present apparatus simultaneously effects a crystal forming and setting operation.

Inasmuch as many changes could obviously be made in the construction of the apparatus, herein described and many apparently wide different embodiments of my invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The method of installing thermoplastic unbreakable watch crystals which comprises bowing a thickness of the unbreakable material forming the crystal in correct relation with regard to the bezel case in which it is to be mounted, and cutting through the thickness of bowed unbreakable material with the bezel case in heated condition to thereby shape and directly position the cut material in the bezel of the case.

2. The method of installing thermoplastic watch crystals which comprises bowing a thickness of the thermoplastic material forming the crystal in correct relation with regard to the bezel case in which it is to be mounted, placing the bezel case against the material, and heating the bezel case to melt a peripheral portion of the thermoplastic material to fit and securely position the same in the bezel of the case.

3. The method of installing thermoplastic unbreakable watch crystals which comprises employing a mold having the configuration of the bezel of the watch bezel case in which the crystal forming material is to be mounted, bowing a thickness of the thermoplastic unbreakable crystal forming material against the mold, and placing the bezel case in a heated condition against the bowed thermoplastic material to melt through the material and directly fit a shaped peripheral portion of the same in a mounted position in the bezel of the watch bezel case.

4. The method of installing thermoplastic unbreakable watch crystals which comprises employing a mold having the configuration of the bezel of the watch bezel case in which the crystal forming material is to be mounted, bowing a thickness of the thermoplastic unbreakable crystal forming material against the mold, placing the bezel case in a heated condition against the bowed thermoplastic material to melt through and directly fit a shaped peripheral portion of the same in the bezel of the case, and partially relieving the bowed condition of the thermoplastic material in order that the peripherally molten portion of the material be urged to completely fill the bezel of the watch case in which the crystal is mounted.

5. The method of installing thermoplastic unbreakable watch crystals which comprises positioning a blank of the unbreakable material forming the crystal of a size larger than the bezel in correct relation with regard to the bezel case in which it is to be mounted, and melting through the blank with the bezel case, in heated condition, to directly shape a peripheral portion of the material and securely position the same in the bezel of the case.

6. The method of installing thermoplastic unbreakable watch crystals which comprises employing a mold having the configuration of the bezel of the watch bezel case in which the crystal is to be mounted, positioning a blank of thermoplastic unbreakable crystal forming material of a size larger than the bezel against the mold, and placing the bezel case in a heated condition against the positioned thermoplastic material to melt through the same and directly fit a shaped peripheral portion of the material in a mounted position in the bezel of the watch bezel case.

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