Master WATCHMAKING

SHOP TRAINING JOB GUIDES

LESSON 20

The Overcoil Hairspring

—

Sections 390 - 393

CHICAGO SCHOOL OF WATCHMAKING

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SEC. 390—Purpose of the Overcoil

The type of hairspring described in the previous lessons is referred to as a **flat** hairspring because all of the coils lie in the same plane. The hairspring referred to in this lesson is known as the **overcoil** or **Breguet** hairspring. An overcoil hairspring is one in which the outside coil has been raised up and laid over the body of the hairspring. The name Breguet is used by many watchmakers, when referring to an overcoil hairspring, in honor of the horologist Louis Breguet who first conceived the idea of the overcoil. The overcoil is used in the better grades of watches in order that a closer isochronal rate may be obtained.

There are many different shapes of overcoils and many articles and books have been written discussing the theoretical purpose of these various shapes and forms. Our purpose in this lesson is to teach the student watchmaker to form and manipulate the overcoil hairspring irrespective of the factory which designed and manufactured the original spring. It is an easy matter for an experienced watchmaker to recognize the difference between an Elgin and Waltham hairspring by the shape of the overcoil. However, the practical repairman must be able to handle every type of overcoil regardless of manufacture. There are times when it is necessary to form complete new overcoils. He must be able to reshape overcoils which have become bent or

distorted or are not the proper height or are improperly centered. The hairspring, if handled properly, will seldom became distorted. In the average repair shops this type of repair is usually encountered when the watch has been previously worked upon by an incompetent workman. It is important that the watchmaker examine the hairspring carefully when making an estimate for repairs.

In order for a hairspring to function properly in the watch we must be sure that:

1. The hairspring is true in the flat and round.

2. The outside coil of a flat or an overcoil hairspring lies between the regulator pins and is concentric with the center of the hairspring when the stud is in position. At the same time the hole in the collet must be concentric with the axis of the balance staff.

3. A flat hairspring must be level with the balance cock and be free of any interference during the winding and unwinding caused by the oscillations of the balance.

4. The section of overcoil which follows through the regulator pins from the stud to approximately an equal distance beyond the regulator pins must be level with the body of the hairspring and parallel to the balance cock and of the proper height in order that the body of the hairspring will be level with the balance arm. It must be free of any interference during the winding and unwinding caused by the oscillations of the balance.

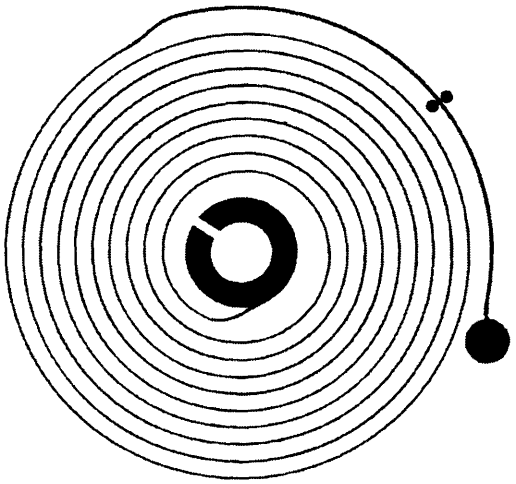

Fig. 20-1

SEC. 391—Types of Overcoils

The flat hairspring illustrated in figure 20-1 shows the outside coil properly formed with relation to the stud and regulator pins. Figure 20-2 illustrates a hairspring with the overcoil properly formed with relation to the stud and regulator pins.

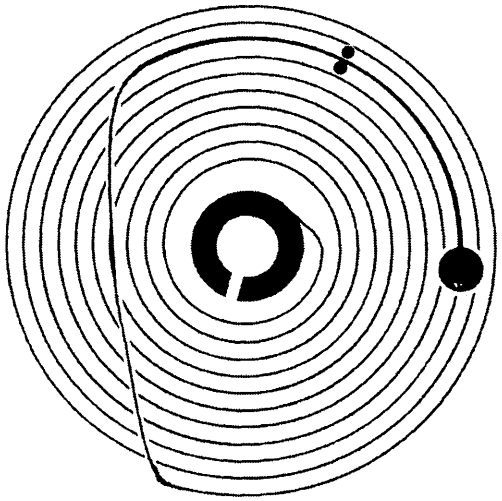

Fig. 20-2

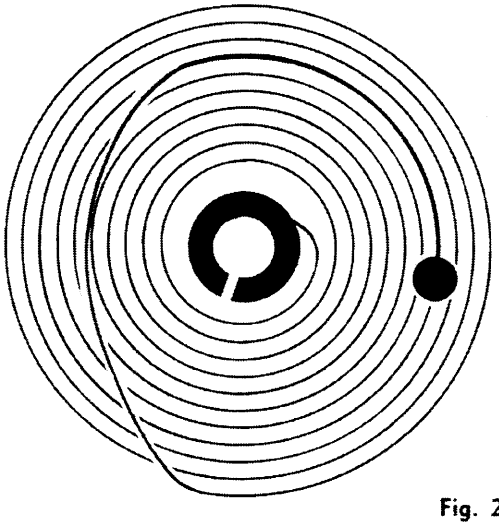

Fig. 20-3

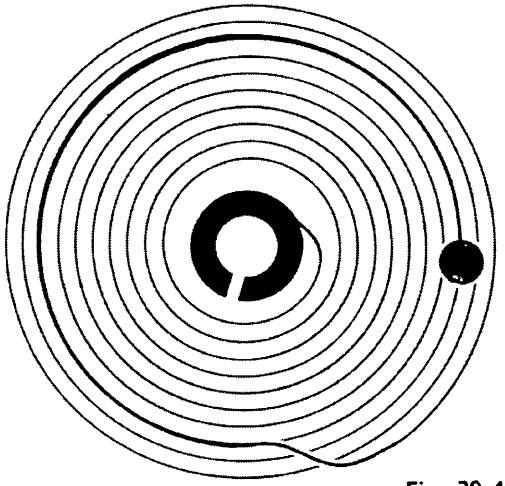

Fig. 20-4

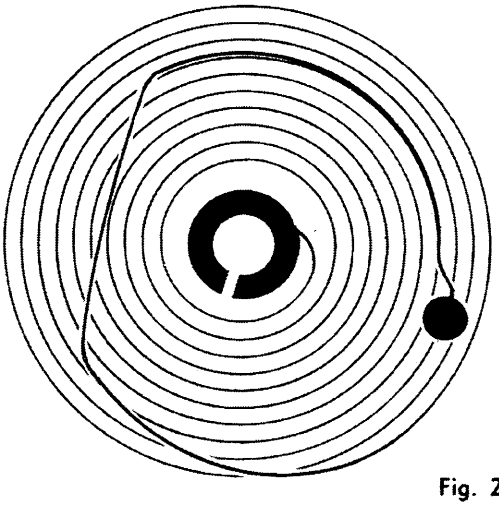

Fig. 20-5

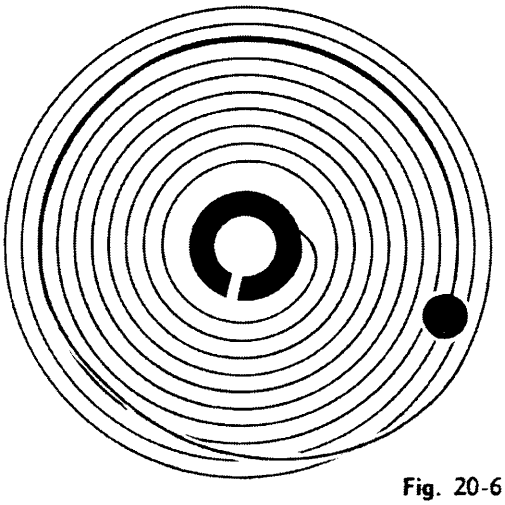

Fig. 20-6

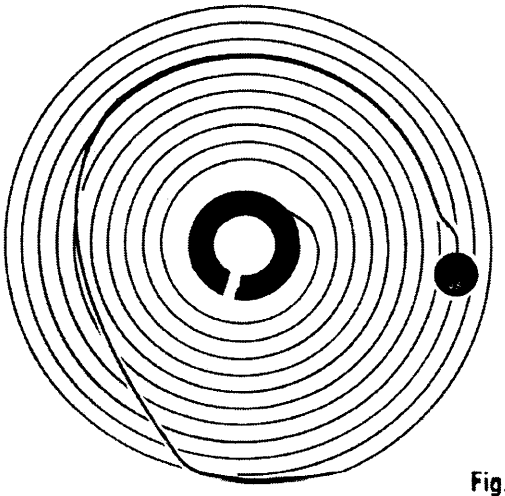

Fig. 20-7

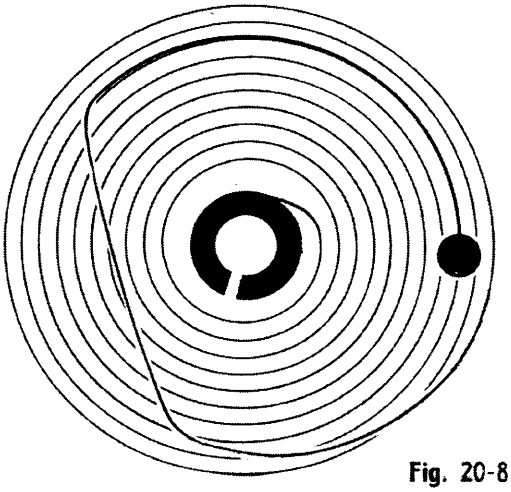

Fig. 20-8

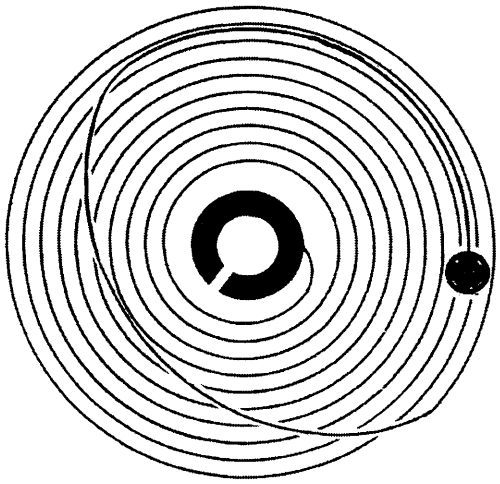

Fig. 20-9

The following illustrations, figures 20-3, 20-4, 20-5, 20-6, 20-7, 20-8, 20-9, are presented to impress the student with the fact that regardless of the shape of an overcoil the section which lies between the regulator pins is primarily the same. Study these illustrations carefully and notice that this section of the overcoil is of the same shape regardless of which coil it follows, the length or shape of the sections bent up from the body of the hairspring, or the position of the stud. These illustrations are not used to show any particular form or shape of overcoil and must not be construed as typical overcoils as found in the modern watch. However the overcoils shown in figures 20-2, 20-6 and 20-9 are more or less the basic types of overcoils in use today. The overcoils in these illustrations all lie in one direction. However, this is only for the purpose of illustration, as they may lie in the opposite direction as well. The direction is determined by the location of the stud and regulator pins on the balance cock.

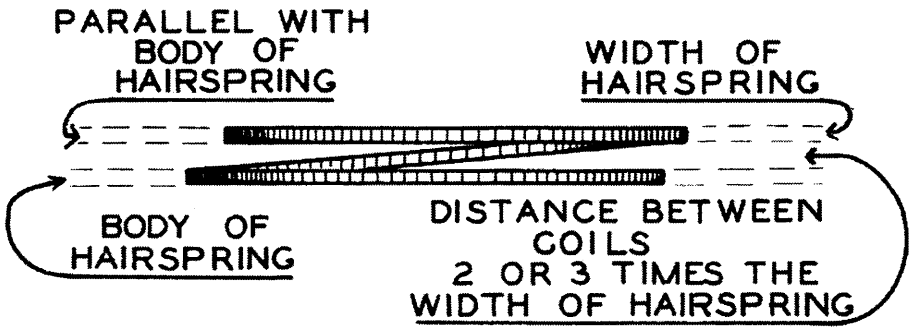

Fig. 20-10

SEC. 392—Height of Overcoil

Figure 20-10 shows a side view of a hairspring with an overcoil raised above and parallel to the body of the spring. The distance between the overcoil and the body of the hairspring is given as approximately 2 or 3 times the width of the hairspring coil. This is the distance we will use for our practice work, but there are times when this distance will not conform strictly to these measurements but is determined by the space allotted between the balance cock and the arm of the balance wheel and location of the hole in the collet into which the inner coil is pinned. Notice particularly that the portion of the overcoil referred to in figures 20-3 through 20-9 must be parallel to the body of the hairspring as shown in figure 20-10.

Figure 20-11 illustrates two distinctive types of bends used to raise the outside coil of the hairspring. The upper illustration is the one we will use in all of our practice work. The lower illustration shows a type of bend formed by the factory at the time the hairspring is hardened and tempered. It is possible for the repairman to make special tools which will enable him to form this type of bend, but for all practical purposes it is not necessary. Even though a hairspring may be distorted, these two sharp, factory-formed bends will rarely become so, and the proper manipulations required to place the hairspring in first class order do not require alterations at these points.

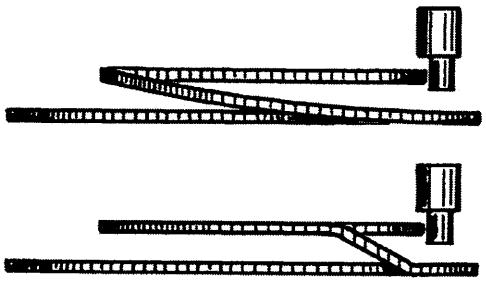

Fig. 20-11

SEC. 393—Raising the Overcoil

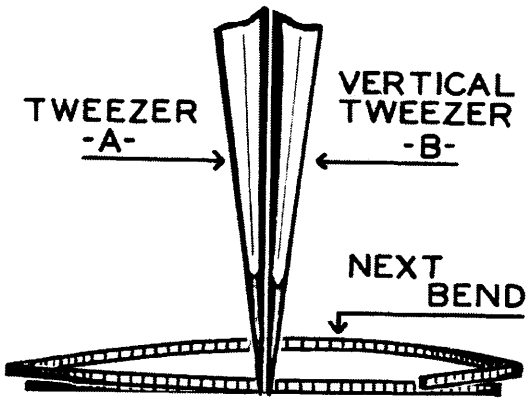

Fig. 20-12

For raising an overcoil the student will need two fine pointed hairspring tweezers and an overcoiling tweezer. Overcoiling tweezers come with points of different curves but in the trade an overcoiling tweezer number 10-1 or 10-0 will handle the average repair job. The first step in raising the overcoil is to lay the hairspring on a flat surface. The ground glass plate previously mentioned is excellent. The two hairspring tweezers are then placed as close together as possible, approximately 7/8ths of the distance from the end of the outside coil, figure 20-12. Place the tweezers in a vertical position as in figure 20-12, A and B. Holding the tweezer B firmly in position, move tweezer A toward you or in a manner which will raise the outside coil as shown. **DO NOT RELEASE TWEEZER B** until the overcoil is of the proper height at the approximate point in the illustration which is indicated by the arrow "Next Bend". By not releasing the tweezer B until the coil is of the right height, it is an easy matter to place tweezer A back in the proper place to raise or lower the coil, whichever may be necessary.

When the proper height has been ascertained, place the tweezers A and B at the point marked "Next Bend", figure 20-12. The two tweezers are held vertical and used in the same manner as when raising the overcoil to level the remaining section of the overcoil. The overcoil should be level with the body of the hairspring as in figure 20-10.

There are times when the overcoil will appear as in the two illustrations shown in figure 20-13. In the upper illustration the overcoil is lower in the center than it is on either end. To correct this, grasp the overcoil at its high point C with two pairs of hairspring tweezers and raise the overcoil so that the section BC is level. In so doing the section AB has been raised above the height desired. This section is lowered to the correct height by the method previously described in making bends in the overcoil with two pairs of hairspring tweezers. (See figure 20-12). The actual forming of the overcoil is best accomplished with the aid of overcoiling tweezers. Some experienced watchmakers learned to form the overcoil with one tweezer and a taper pin.

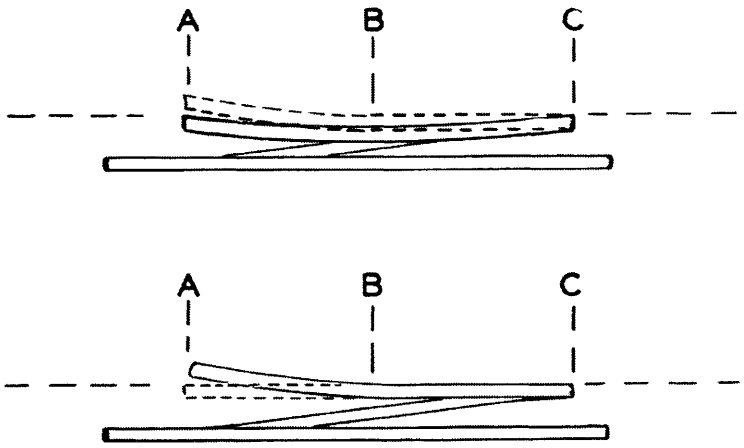

Fig. 20-13

Figure 20-14 illustrates four steps used when forming the overcoil with an overcoiling tweezer.

Step No. 1: The line AB represents the coil of a spring while the dotted section of line AC represents the position this section of coil will be in when bent at O.

Step No. 2: Line AC illustrates the completed bend with the overcoiling tweezers centered directly over the point indicated by the arrow in the previous step.

Step No. 3 illustrates the previous lines AB and AC. The line AD shows the result of too much pressure on the overcoiling tweezer.

Step No. 4 illustrates the method used to bring the line AD back to the position for which it was originally intended (AC). This is accomplished by reversing the overcoiling tweezer as illustrated.

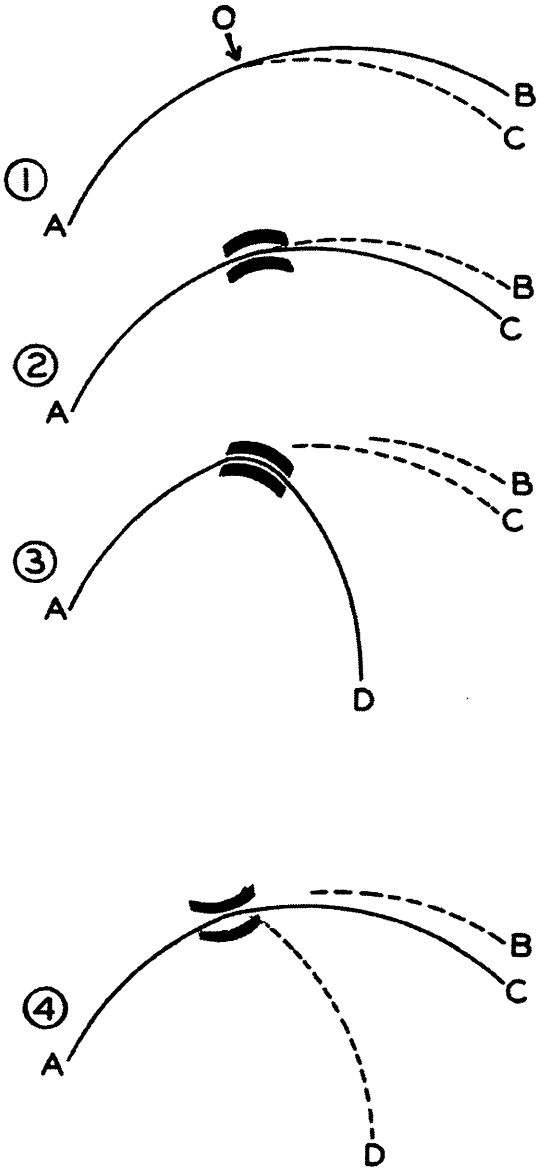

Fig. 20-14

The first bend to make when forming the overcoil of a hairspring is indicated in figure 20-15 by the arrow A. When making this bend, make certain that the overcoil will clear the body of the hairspring. The next bend is determined by the location of the regulator pins when the hairspring is centered over the balance cock. This will be explained more fully in a following lesson. For practice, the student may select any coil, usually the 2nd or 3rd coil of the coils contained in the body of the hairspring, and make the remaining portion follow the coil selected. For our illustration we have elected to make our overcoil follow between the 2nd and 3rd coils and our next bend with the overcoil tweezer will be at the point indicated by the arrow B, figure 20-15.

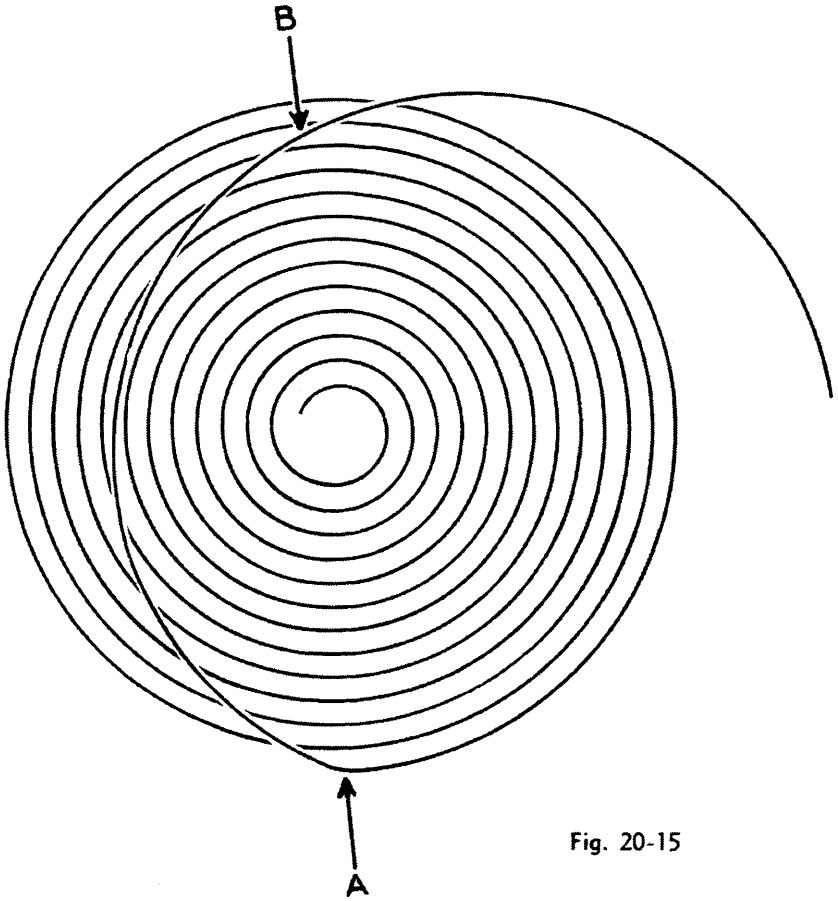

Fig. 20-15

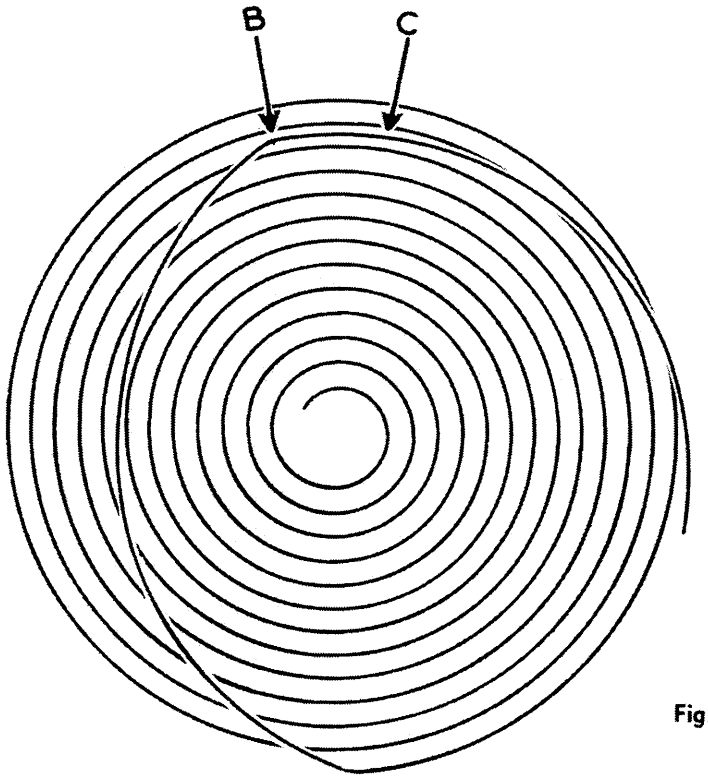

Fig. 20-16

The overcoil will then appear as in figure 20-16 and the next bend will be at the point indicated by arrow C. Continue shaping the coil until it appears as in figure 20-17. After completing the overcoil, check to see that the overcoil is level. Be certain when forming the overcoil in the round to look directly down on the overcoil each time you make an examination.

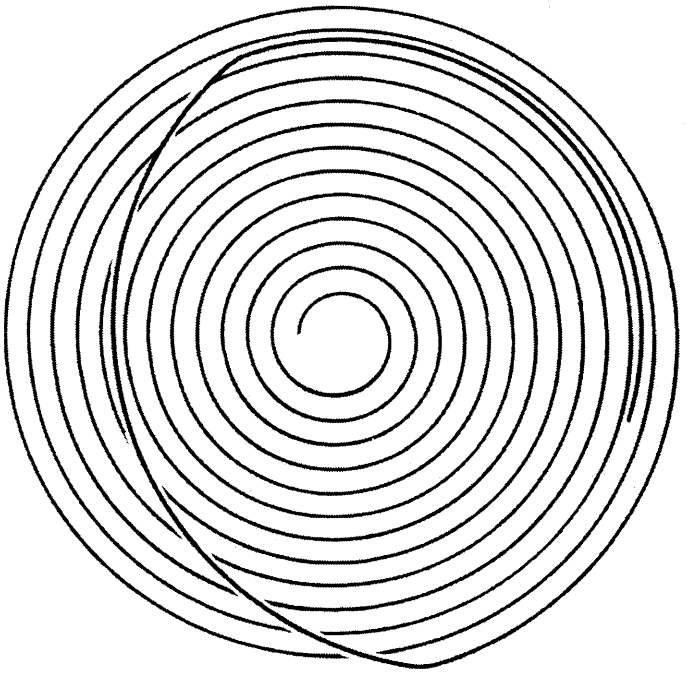

Fig. 20-17