Oct. 17, 1944. R. B. BECKETT 2,360,754

APPARATUS FOR MEASURING BUCKLE OR CENTER STRETCH IN COLD ROLLED STEEL STRIP

Filed Oct. 8, 1941

FIG. 1.

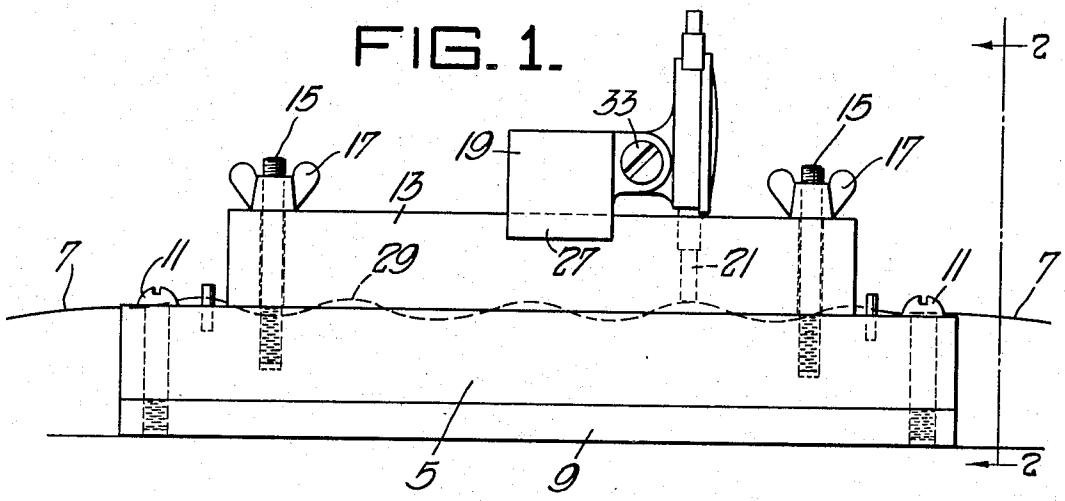


FIG. 2.

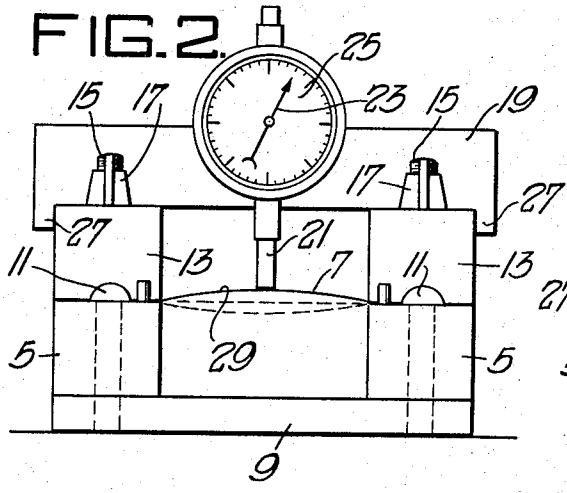


FIG. 4.

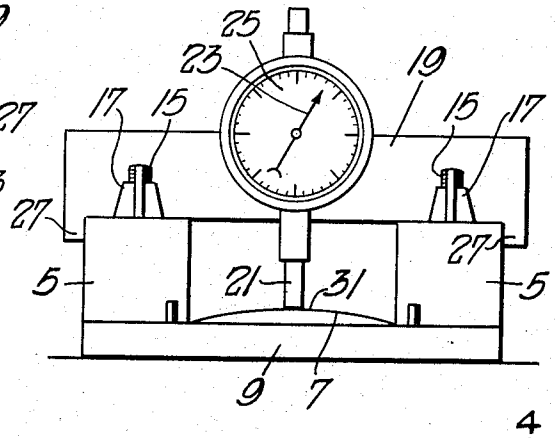
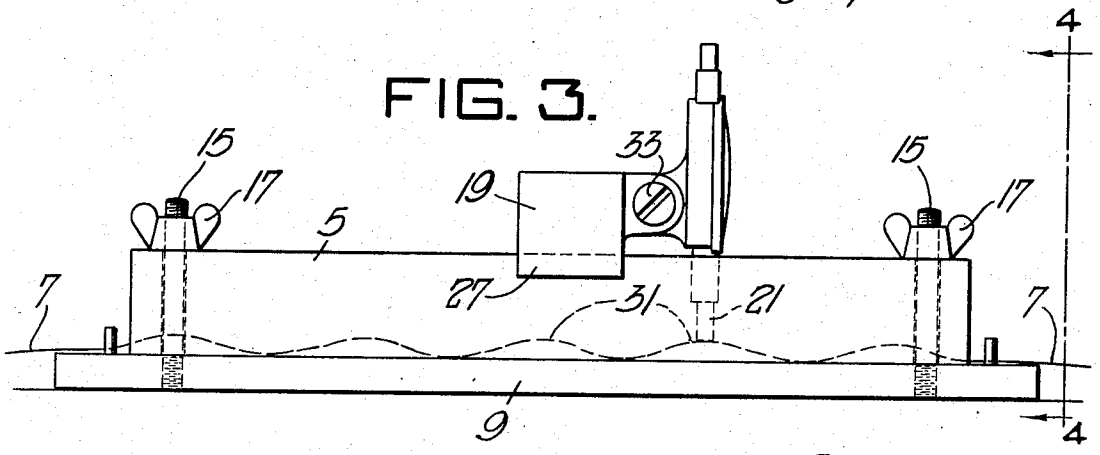


FIG. 3.



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APPARATUS FOR MEASURING BUCKLE OR CENTER STRETCH IN COLD ROLLED STEEL STRIP

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Application October 8, 1941, Serial No. 414,185

5 Claims. (Cl. 33—172)

In the production of steel strip for various purposes, including the production of the so-called "slats" for Venetian blinds, it is found to be desirable, in order to satisfy the demands of the manufacturers of such blinds, to produce the strip from which the slats of the blinds are made, to produce such strip with what is known as a "buckle" in the strip.

In order to produce such a buckle, the strip is worked in such a way that the central portion of the strip is stretched or elongated more than the sides and edges of the strip. This working, however, which may be performed in various ways, is not sufficient to be measured.

The presence of such center stretch in the strip results in an actual elongation of that portion of the strip which, in view of the unaltered condition of the sides and edges of the strip, produces a wavy condition of the center of the strip, the number and extent of the waves depending upon the amount of working to which the central portion of the strip has been subjected.

In the fabrication of slats for Venetian blinds, the strips thus formed are passed through a plurality of rolls which form a "crown" in the strip, one side of which is concave, while the other is convex, after the strip has been passed through these rolls. The strip is passed through these rolls in such a manner that the edges of the strip become stretched more than the central or crowned portion thereof, so that the buckled or wavy configuration of the strip is stretched out.

It will be understood that the strips from which the slats are formed are very thin, they being on the order of from about 0.007 to about 0.012 inch in thickness; and it is frequently desirable to duplicate the amount of buckle in succeeding strips in order to fulfill the requirements of the manufacturers. Consequently, it is desirable to measure the amount of the buckle, such measurements being made accurately in order to obtain exact duplications thereof. It will be obvious that variations in the amount of the buckle cannot be determined by the eye, and, therefore, mechanical measuring devices must be employed.

It will be apparent that where various manufacturers are being supplied, all of which require varying amounts of buckle in the strip, the exactness of the buckle must be determined for proper duplication of the strips for fulfilling the requirements of succeeding manufacturers' orders.

As has been pointed out above, the provision of this buckle is a requisite, since in the subsequent rolling of the strips into slats, where the crown is rolled into the strip, the sides of the strip are lengthened so that the extra length represented in the buckle is necessary in the center to allow the edges to be stretched or elongated to meet the length of the center, which results in a straight Venetian blind slat, that is devoid of any of the original buckle.

The presence of the buckle sometimes is not visible to the eye, and, in any event, it is difficult to determine by the eye variations in such buckle, which variations are to be avoided if a satisfactory strip is to be duplicated in succeeding strips.

The presence of this buckle in the thin strips that are used in slats for Venetian blinds causes the strip to take on a wavy configuration, as has been mentioned above; and if this configuration is duplicated exactly in succeeding strips, such strips will be duplicated.

In order to ascertain the exact amount of buckle which is present in a strip which fulfills satisfactorily a manufacturer's specifications, it becomes necessary, therefore, to measure accurately the amount of the buckle.

One way of measuring the amount of such buckle is to apply an accurately calibrated measuring device thereto, obtaining thereby an accurate determination of the number of buckles in a given length of strip, and also an accurate measurement of the depth, and, therefore, the amount of the buckle present in the strip.

It will be seen, therefore, that one of the objects of the present invention is to provide a method and means for the accurate measurement of the amount of buckle or center stretch in a thin steel strip that has been worked in such a way as to produce such a buckle or center stretch.

Further objects of the invention will become apparent as the description proceeds, and the features of novelty will be pointed out in greater particularity in the appended claims; and it will be understood that the specific embodiment of the invention described herein and illustrated in the accompanying drawing is illustrative only of the features of the invention and one mode of its application, the specific details of the invention being subject to modifications and changes which may be necessary to adapt the invention to varying conditions and uses.

The invention will be understood more readily

by reference to the accompanying drawing wherein

Fig. 1 represents a side elevation of one form of apparatus adapted to measure accurately the amount of buckle in a thin steel strip which has been worked to become buckled in the manner described above;

Fig. 2 is an end elevation of the apparatus of Fig. 1, the view being taken on the line 2—2 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a side elevation similar to Fig. 1, but showing the modified form of the apparatus;

Fig. 4 is an end elevation of the apparatus of Fig. 3, the view being taken on the line 3—3, looking in the direction of the arrows.

Referring more particularly to the drawing, wherein like reference characters designate like parts of the equipment in the respective views, it will be seen that the invention is predicated on a method for measuring the amount of buckle or center stretch in a strip of cold rolled steel which has been worked a slight amount to produce the buckle or center stretch in the steel strip, the method comprising confining both edges of the strip along a flat surface for a sufficient length, allowing the center of the strip to assume a uniform buckle or center stretch, which causes the strip to follow the uniform curve which flows alternately above and below the level of the confined edges.

Also, the strip of steel may be confined at its edges, and supported for its entire width on the flat surface, this procedure permitting the buckle to extend only above the level of the edges, thus controlling the buckle to a greater degree while being measured.

In either of these procedures, a measuring device is passed uniformly over the buckled surface, and the amount of the buckle and the number of waves in the strip in a given length thereof, are measured.

This measurement and determination are important in that when the manufacture of Venetion blinds, for example, receives a shipment of strips which are buckled in accordance with his specifications, a determination of the amount of buckle in those strips enables a duplication of that buckle in succeeding strips, thereby assuring uniform quality of strip being supplied to the manufacturer.

The character of the buckle required by the manufacturer depends upon the character of the equipment with which a particular manufacturer forms the slats for his blinds. Thus, specifications may call for a long, shallow buckle, or a short, deep buckle.

The present invention provides equipment for measuring either type of buckle.

In the drawing, reference character 5 designates flat surface holding means for a strip 7 of the requisite thinness for forming slats for Venetian blinds. The holding means 5 constitute heavy steel bars which are joined by a plate 9, to which the bars 5 are secured by means of screws or other fastening means 11. In Figs. 1 and 2, the bars 5 are provided with complementary bars 13, the edges of the strip 7 being adapted to be secured between the bars 5 and 13 and to be clamped into position therebetween by means of screws 15, which, conveniently are provided with wing nuts 17 for facilitating operation of the screws. The screws 15 in Figs. 1 and 2 pass through the top bars 13 and into the bars 5, so that actuation of the screws 15 releases or tightens the bars, enabling movement thereof toward or away from one another depending upon the direction in which screws 15 are turned, for releasing and clamping the strip to be measured.

In Figs. 3 and 4, the screws 15 pass all the way through bars 5 and into plate 9, which extends the entire length of the apparatus, the strip 7 being in this instance clamped between the bars 5 and the plate 9.

In Figs. 1 and 2, the bars 13 are bridged by a transverse bar 19 which slides along the top of the bars 13 between the ends of the bars 13, the extent of travel of the bridge 19 being determined by the position of the screws 15 at the end of the bars 13.

In Figs. 3 and 4, the bridge 19 travels in like manner along the top of bars 5. The bridge 19 carries a measuring device, which is shown as comprising a spring-pressed plunger 21, which actuates a suitably mounted indicator pointer 23, which moves over a dial 25, which is graduated into suitable values, such as for example, thousandths of an inch. The bridge 19 also is flanged, as indicated at 27 so as to travel along its mounting bars without lateral displacement, the flanges 27 acting as guides for the bridge 19.

Accordingly, the end of the plunger 21 engages the buckled surface of the strip under constant uniform pressure, and, by virtue of the guides 27, the plunger 21 moves in a straight line along the length of the strip.

It will be seen from Figs. 1 and 2, that when the strip is not supported between its edges, the buckled surface of the strip assumes a uniform curve, as indicated at 29, which extends equally above and below the level of the confined edges; whereas, when the strip is supported at both the edges and throughout its entire width on the flat plate 9, the plate permits the buckle 31 to extend only above the level of the confined edges.

The dial gauge 25 is indicated as being connected to the bridge 19 by means of a hinge joint 33.

It will be seen, therefore, in both forms of the apparatus, the dial gauge 25 is mounted so that it can slide along top surfaces of the clamping bars, the length of travel being limited by the distance between the winged nuts 17 on the screws 15, and the screws themselves. This distance may be any desired length, in accordance with whatever length of the device is desired. As the dial gauge is allowed to slide along the two top surfaces, the contact pin or plunger 21 rides along the buckle or center stretch at the exact center of the strip being tested, thereby causing the dial 25 to show the exact height of the buckle at any point. The high and low spots are recorded in the order of their occurrence, and an average difference between the high and low spots is used as the height of the buckle or center stretch. This is true in either form of the equipment, and when duplicated in succeeding strips indicates a duplication of the specification of the original strip in the succeeding strips.

The dial 25 translates invisible waves or buckle and variations in the amount thereof into readily visible and readable values.

While the description of the invention has been specific to the preparation of a strip suitable for slats of Venetian blinds, it will be apparent that a strip having a buckle or center stretch may be applied to other uses.

It may be mentioned at this point that when in cold rolling of strip there is produced a buckle in the strip, as the strip is given further passes

through successive stands of rolls, such further rolling is conducted so that the buckle will be removed. This operation, of course, takes place in the same plant, and the strip passes through the successive roll stands simultaneously and continuously as the strip unwinds from the reel at one end of the roll stands and winds on another reel at the other end of the stands. Thus, the purpose is to produce strip that is free from buckle and other imperfections and substantially perfectly flat.

But in the present case the strip stock for blind slats is rolled purposely to produce a buckle in it, because the equipment of many of the manufacturers of Venetian blinds is constructed so that it will handle only strip that has been buckled, and buckled in a certain manner, and in a certain amount.

In the present instance, the buckle is not removed by a continuous rolling through successive stands of rolls, but the buckle remains in the strip until after shipping to the manufacturer of slats for Venetian blinds, the buckled strips are passed through the set of forming rolls which form the slat, and wherein the requisite "crown" is imparted to the slats. At the same time, the passing of the strip through the forming rolls completely removes the buckle from the strip as it is formed into a slat.

Therefore, it will be seen that, in accordance with the present invention, one of the important features of the improvements represented thereby resides in imparting to the strip a feature which generally is undesirable and must be removed from the strip if present, before the strip can be fabricated properly into desired articles to be made therefrom.

This usually objectionable feature is the buckle, which although for the great majority of uses of the strip is removed as the strip is rolled, in the present case is imparted purposely to the strip which is to be formed into blind slats, the presence of such buckle being a requisite for the satisfactory production of Venetian blind slats by the manufacturers thereof, who buy these purposely buckled strips which have been made for them.

Consequently, contrary to the usual practice of removing buckle continuously from the strip as the strip is rolled, in the case of the buckled strip comprising Venetian blind stock, the purposely produced buckle is left in the strip, which strip will be used in some location far distant from the mill which produced it, and at an indefinitely long time after it has been produced.

Therefore, in the production of this buckle in the strip, what is usually an unwanted and objectionable defect is converted into a desirable and requisite feature in Venetian blind stock and which, in accordance with the present invention, is utilized for the rapid duplication of succeeding strips which fulfill the specifications of slat manufacturers.

Also, contrary to the usual practice of removing any buckle immediately during the rolling of strip, for the present purpose the buckle is retained in the strip and is not removed therefrom until the manufacturer of the slats for blinds passes the strip through the crowning rolls, which crown the strip and at the same time pull the sides and edges of the strip more than the center thereof, thus pulling out the buckle and producing a finished slat which has been formed with a proper crown and which is free from buckle.

While a large number of Venetian blind slats are made from flat strip stock that originally is free from buckle, nevertheless the present mechanical equipment of many manufacturers of slats for Venetian blinds will operate properly only on buckled stock in the production of the crown in the strip as it is formed into the slats, and consequently the buckled strips are necessary articles of commerce, and specifications vary as to the amount of buckle, some requiring deep, short waves while others require long, shallow waves.

Therefore, a mill which produces strips for Venetian blind manufacturers must not only supply such manufacturers with flat strip free from buckles, but must be prepared to duplicate on short notice any strip, either flat or with any type of buckle that may be required to fill satisfactorily and speedily the orders which the manufacturers of the blinds may require.

The present invention provides a ready procedure and equipment to enable such duplication to be made readily and quickly at any time that such duplication may be required.

While the invention has been described specifically in connection with strips that are to be formed into slats for Venetian blinds, it is useful in connection with any use of the strips which requires a buckle therein.

I claim:

1. Apparatus for measuring the amount of buckle in a metal strip having a buckle or center stretch imparted thereto, which comprises instrumentalities for confining a portion of the strip along the edges thereof while allowing the buckle in the strip to assume its normal configuration under conditions of clamping, and measuring means mounted on the said instrumentalities adapted to follow the buckle in the strip along the center line of the strip for indicating amounts of high and low portions of the configuration of the buckle.

2. Apparatus for measuring the amount of buckle in a metal strip having a buckle or center stretch imparted thereto, which comprises, in combination, instrumentalities for clamping a test portion of the strip along the edges thereof while allowing the buckle in the strip to assume its normal configuration under conditions of clamping and support to the strip, and measuring means mounted on the said instrumentalities including a portion adapted to follow the configuration of the buckle in the strip along the center line thereof, and means for indicating amounts of high and low portions of the configuration of the buckle responsively to movement of the said following portion.

3. Apparatus for measuring the amount of buckle in a metal strip having a buckle or center stretch imparted thereto, which comprises, in combination, instrumentalities for clamping a test portion of the strip along the edges thereof while leaving the strip unsupported between the clamp edges, thereby allowing the buckle in the strip to assume its normal configuration when the strip is unsupported between its edges, and measuring means mounted on the said instrumentalities including a resiliently mounted contact pin adapted to follow the configuration of the buckle in the strip, and means for indicating amounts of high and low portions of the configuration of the buckle responsively to up and down movement of the contact pin as it follows the configuration of the buckle, the contact pin being mounted to follow the center line of the strip be-

ing tested and held against lateral displacement therefrom.

4. Apparatus for measuring the amount of buckle in a metal strip having a buckle or center stretch imparted thereto, which comprises, in combination, instrumentalities for clamping a test portion of the strip along the edges thereof, a support for the strip extending across the clamped edges while allowing the buckle in the strip to assume its normal configuration when the strip is supported between its edges, and means for indicating amounts of high and low portions of the configuration of the buckle responsively to up and down movement of a contact pin as it follows the configuration of the buckle, the said contact pin being mounted to follow the center line of the strip being tested and held against lateral displacement from the said center line.

5. Apparatus for measuring the amount of buckle in a metal strip having a buckle or center stretch imparted thereto, which comprises instrumentalities for confining a portion of the strip along the edges thereof while allowing the buckle in the strip to assume its normal configuration under conditions of clamping, and measuring means mounted on the said instrumentalities adapted to follow the buckle in the strip along the stretched portion thereof for indicating amounts of high and low portions of the configuration of the buckle.

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