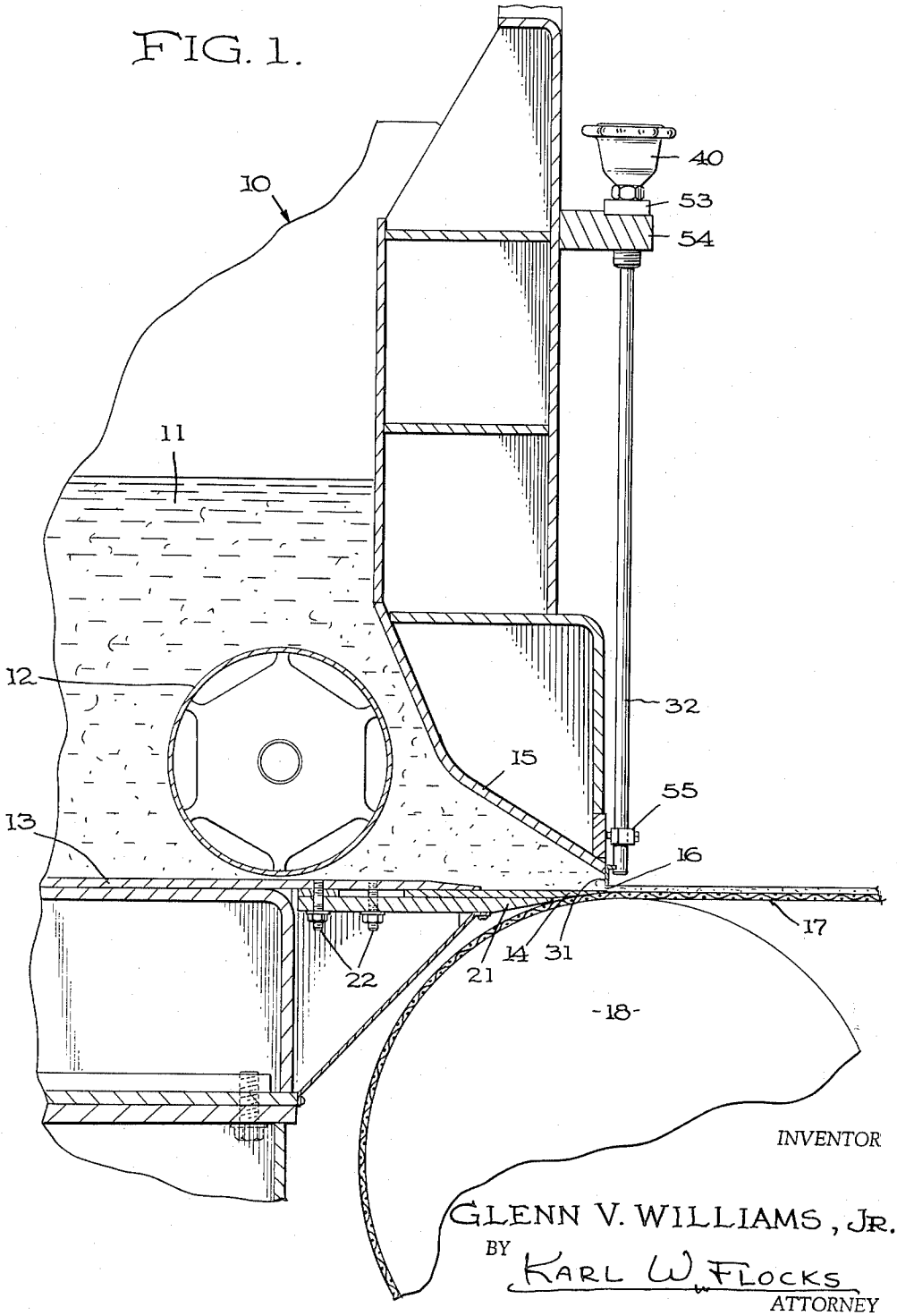
Feb. 8, 1966 G. V. WILLIAMS, JR 3,233,575

SLICE LIP ADJUSTMENT MECHANISM

Filed June 3, 1964 3 Sheets-Sheet 1

FIG. 1.



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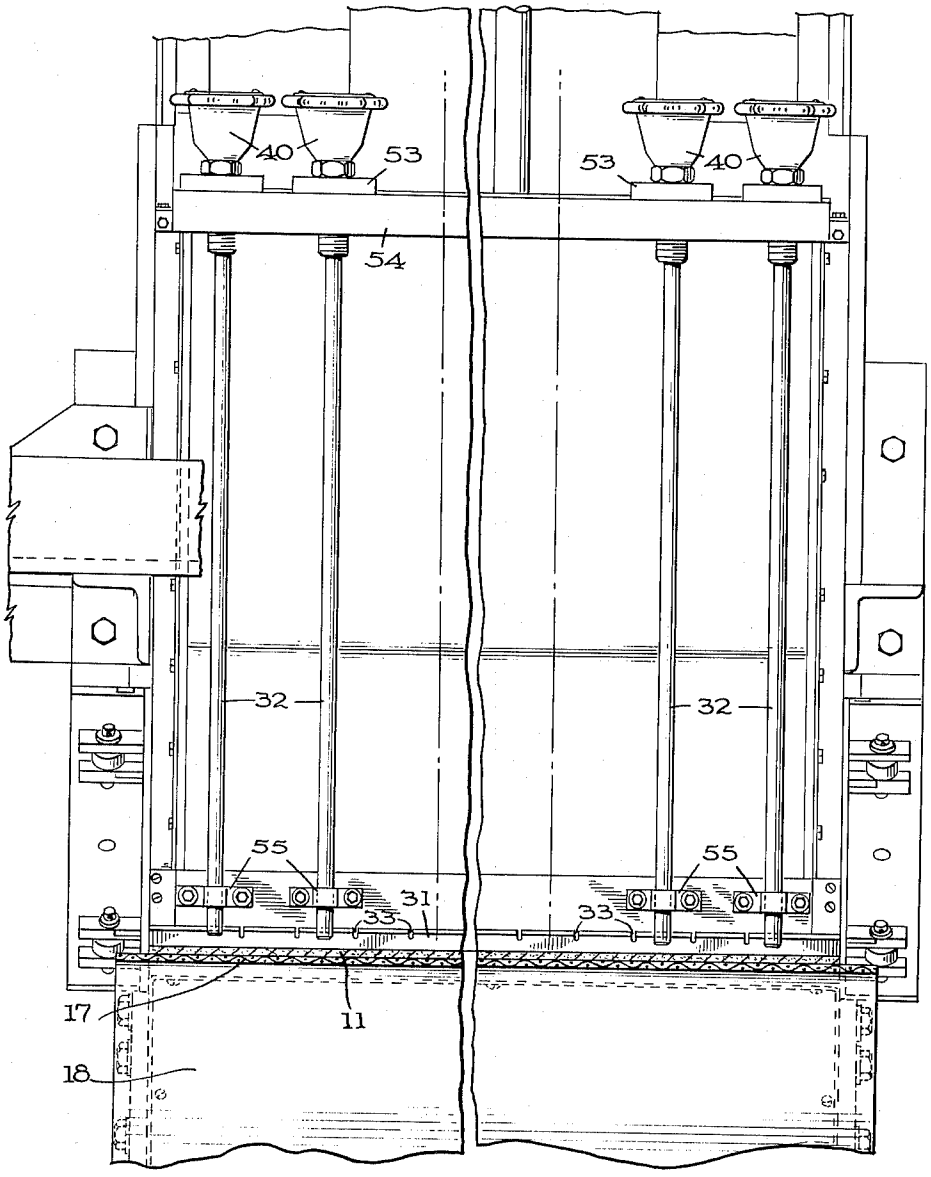
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FIG. 2.



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FIG. 3.

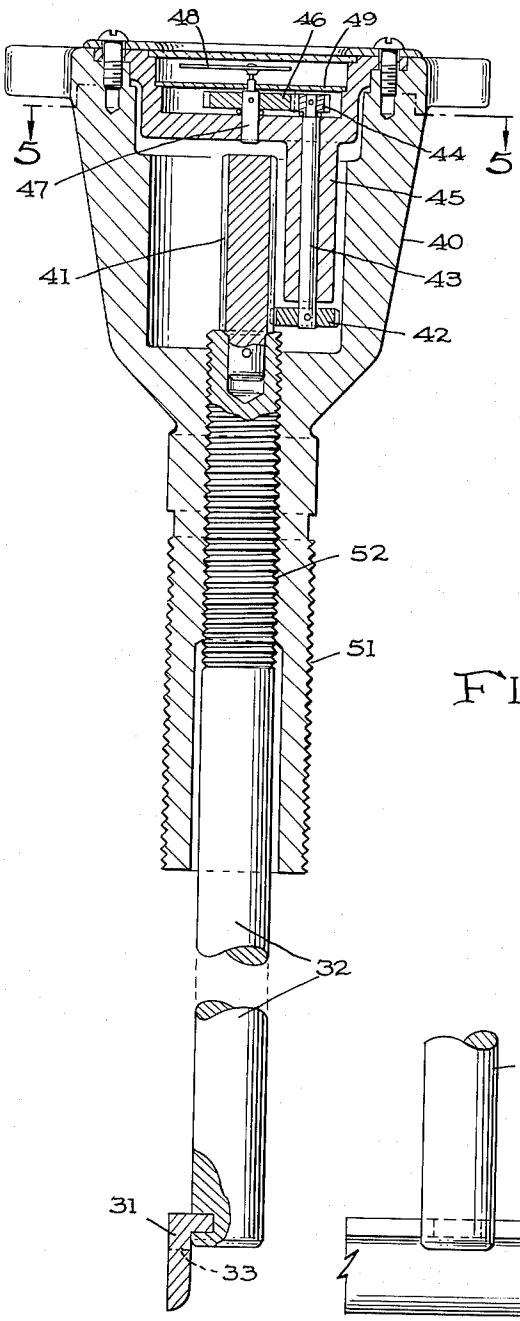


FIG. 4.

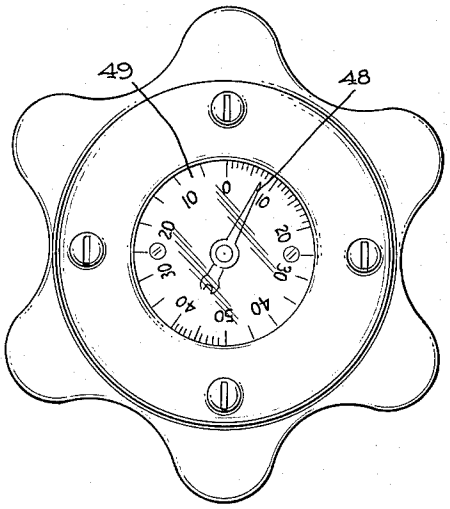


FIG. 5.

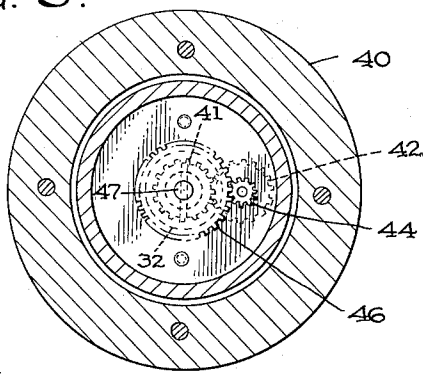
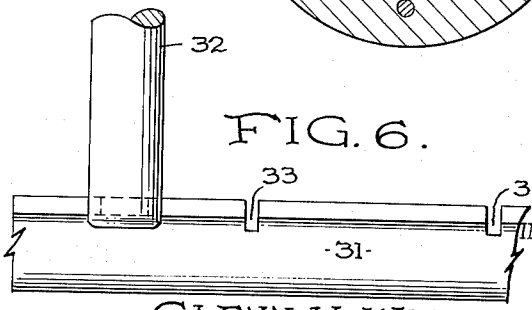


FIG. 6.



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3,233,575

SLICE LIP ADJUSTMENT MECHANISM

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Filed June 3, 1964, Ser. No. 373,606
8 Claims. (Cl. 116—124)

The present invention relates to a paper making machine and has particular reference to an improved slice lip adjustment mechanism and the indicating hand wheel incorporated therein.

A paper making machine usually has a head box which has the main function of taking a flow of stock from a single round pipe and delivering on to a wire at a uniform and steady rate, velocity and consistency for the full width of the machine. This delivery should be free of cross directional flow, instability and flocculation.

Although the term "head box" is used to refer to one of the complete units of the paper machine it is also used for one of the three parts that make up a head box, the inlet or manifold and the slice being the other two parts.

In breaking down the function or requirements of a head box as a unit to its three parts, the job of flow spreading is assigned to the inlet while the slice has the job of directing the stock onto the wire at the proper angle and velocity. If the inlet did its job effectively, the head box part would become superfluous. However, since this is generally not the case, the head box part is called upon to complete the job of flow spreading left undone by the inlet, by introducing such things as flow chambers, baffles, and various mechanical devices.

The jet of stock leaving the slice must be uniform in velocity across the full width of the machine if the sheet of paper being made is to be uniform in weight. Because of this requirement, the height of the slice opening is very critical. If the flow of stock to the slice is uniform, the slice orifice or opening need only be uniform. However, since some inlets are so ineffective, the job of flow spreading cannot even be completed within the head box part and compensation must be made at the slice by varying the opening across the width of the machine. Even if conditions ahead of the slice are perfect, the slice opening may have to be varied across the width of the machine in order to purposely vary the jet velocity to compensate for conditions downstream from the head box.

One of the ways in which the slice opening may be varied is by means of adjusting screws spaced across the width of the machine and attached so as to warp the top slice lip or a profile bar attached thereon. It is only by checking a set of cross-machine weight samples or by referring to the chart of an electronic basis recorder which has the capability of recording the cross-machine basis weight profile of the sheet of paper being made, that the paper maker can determine if the slice opening should be adjusted. Especially in the case of weight samples, the paper maker can only determine the general area or areas requiring adjustment and not the exact screw or screws to be adjusted, and therefore there is a sense of trial and error involved in the adjusting of these screws.

For this reason, it is advantageous to the paper maker to have some indication of the shape of the top slice lip or a profile bar, whichever the case may be, which can be indicated by the vertical position of each adjusting screw. With the mechanism of the present invention the operator of the machine knowing the position of each screw may be able to select which screw should be adjusted and if he has adjusted the wrong screw, he can return it to its original position.

Also, in the case of adjustments being made by referring to weight samples, there can be a combination of screw settings within a given area to obtain a given weight. This can result in a poor weight profile within the area from which a sample has been taken although the average weight of the profile may be as required. This means that the top slice lip or the profile bar can be warped to an unnecessary degree where it can be permanently distorted. For this reason it is good practice now and then to set the top slice lip or the profile bar straight and start all over in order to prevent permanent distortion. With the mechanism of the present invention wherein there is a means which indicates the position of the adjusting screws, over-warpage would never occur. In addition, the top slice lip or the profile bar can easily be returned to a straight position should it be found to be necessary.

The present invention also seeks to provide a very fine screw adjusting mechanism with an accurate indication of its position.

Also, with the new arrangement it is possible to obtain a continuous reading of the position of each of the slice adjusting screws and to obtain a much more accurate reading than formerly obtained in equipment of this general type.

These as well as further advantages which are inherent in the invention will become apparent from the following description, reference being made to the accompanying drawings, wherein:

FIG. 1 is a cross sectioned elevation of a pressure head box;

FIG. 2 is a front view of the pressure head box of FIG. 1;

FIG. 3 is a detailed sectioned view of a hand wheel adjustment mechanism of the present invention;

FIG. 4 is a plan view of the hand wheel adjustment mechanism of FIG. 3;

FIG. 5 is a cross section along line 5—5 of FIG. 3; and

FIG. 6 is a partial front view of the profile bar and adjustment shown in FIG. 3.

Referring to the drawings, there is shown in FIG. 1 a cross section view of the head box 10 of a paper making machine. Paper stock 11 is received into head box 10 through an inlet (not shown). A distributor roll 12 breaks up lumps in paper stock 11 thereby allowing the feeding of a more uniform consistency of this paper stock 11 to the passage formed between the floor portion 13 of head box 10 with its extension formed by apron board 14, slice surface 15, and the side walls of head box 10. The paper stock 11 is thus enabled to flow out of nozzle or slice opening 16 onto endless forming wire 17 which travels around breast roll 18 placed immediately below the nozzle or slice opening 16.

A horizontal lip adjustment may be made by movement of apron board 14 clamped between floor portion 13 and support member 21, by means of bolts 22.

Profile bar 31 which determines the thickness of the paper stock flowing from the slice or nozzle 16 onto the forming wire 17 may be adjusted at different points along its entire length by adjusting rods 32 as shown in the front view of the machine in FIG. 2. The warping action of profile bar 31 is facilitated by means of grooves 33 spaced along bar 31 to increase its flexibility. Attachment of adjusting rod 32 to profile bar 31 is made by means of a dove tailing arrangement or by any convenient means which will allow a vertical movement of rod 32 and bar 31 in unison. FIGS. 3 and 6 show a larger view of this connection. The horizontal section of profile bar 31 fits into a groove in adjusting rod 32 and is held in that groove by a spring action in bracket 55 pressing the adjusting rod horizontally against the horizontal section of profile bar

31. With this type of connection the profile bar 31 may also be moved sidewards for horizontal adjustment. Also, it should be noted that adjusting rods 32 could be attached directly to the top slice lip without the intermediate use of a profile bar. Therefore slice lip adjustment is made either through warping of a profile bar or warping of a top slice lip.

The vertical adjustment of adjusting rod 32 which does not rotate during the adjustment is made by means of slice lip adjusting hand wheel 40 shown in a cross sectioned detailed view in FIGS. 3 and 5. As hand wheel 40 is rotated around nonrotating adjusting rod 32, engagement between pinion wire 41 and gear 42 causes drive shaft 43 and gear 44 within dial case 45 to both rotate and revolve in the same direction as hand wheel 40. Gear 44 meshing with gear 46 rotates pointer shaft 47 and pointer 48 in an opposite direction to hand wheel 40 within dial case 45.

Since the slice screw adjusting mechanism disclosed here must be capable of making adjustments within several thousandths of an inch, a differential screw has been used by which means hand wheel 40 is threaded on the outside as well as on the inside by screw threads 51 and 52 respectively. Outside threads 51 cooperate with threads on the inside of slice adjusting nut 53 while inside threads 52 cooperate with the upper portion of adjusting rod 32 having threads thereon. Brackets 54 and 55 support the upper and lower sections respectively of adjusting rod 32.

As an example for use in paper making, threads 51 on hand wheel 40 and slice adjusting nut 53 may be twelve threads per inch, while the threads 52 of hand wheel 40 and adjusting rod 32 may be sixteen threads per inch. Turning hand wheel 40 one turn clockwise then lowers said hand wheel 40 one-twelfth inch or .0833 inch with respect to slice frame 54 and raises adjusting rod 32 one-sixteenth inch or .0625 inch with respect to hand wheel 40. The resultant change in position of adjusting rod 32 and profile bar 31 or a top slice lip is .0208 inch downward. In other words, for everyone thousandths of an inch movement of the slice adjusting rod 32, the rod 32 moves three thousandths of an inch in relation to the hand wheel 40 and hand wheel 40 moves four thousandths of an inch in relation to slice frame bracket 54. For ½ inch adjustment of profile bar 31 or a top slice lip, the slice adjusting rod 32 moves 1½ inches in relation to hand wheel 40. Pinion wire 41 should have ample length to remain engaged with gear 42 during at least the ½ inch adjustment of adjusting rod 32.

Continuing the example, gear ratios may be selected so that pointer 48 and pointer shaft 47 are rotated 180° for each .150 inch movement of adjusting rod 32 with respect to hand wheel 40 and .050 inch movement of adjusting rod 32 in reference to tthe slice orifice or nozzle opening 16. An example of calibrations on a dial face 49 is shown in FIG. 4. Dial face 49 has a 0–50–0 calibration indicating movement of an adjusting rod 32 in thousandths of an inch with respect to a zero set point. Dial face 49 may also have at least two color zones which quickly tell the operator whether he has warped the top slice lip or profile bar 31 higher or lower than the zero set point.

Naturally as hand wheel 40 is rotated for the full ½ inch adjustment according to the example above, pointer 48 will rotate many times around the zero set point on the dial face 49. However, the zero set point will very seldom be changed. When zero set points are changed the operator of the machine can visually see that all indicating hand wheels are on the same zero set point because in the above examples they will vary .400 inch in their vertical position for every zero set point difference (i.e. when dial rotates once around dial face the adjusting rod has moved .100 inch with respect to the slice frame and hand wheel 40 has moved .400 inch with respect to the same slice frame).

In the slice adjustment mechanism of the present invention, and by the illustrated example, a hand wheel indicating mechanism has been shown in cooperation with a slice adjusting rod with which movements may be made in thousandths of an inch and shown on a scale having a range equal to the maximum practical warpage of a top slice lip or profile bar. The hand wheel indicating mechanism has the capability of adjusting a profie bar or a top slice lip vertically with very high accuracy while encompassing the widest practical range of movement necessary in this type of paper making.

It will be obvious to those skilled in the art that various changes may be made without departing from the scope of the invention and therefore the invention is not limited to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

What is claimed is:

1. A slice lip adjustment mechanism comprising
a slice lip;
a plurality of adjusting rods attached at spaced intervals along the transverse length of said slice lip;
each of said adjusting rods having a threaded upper portion;
a handwheel-indicating mechanism having an internally threaded portion cooperating with said threaded portion of each of said adjusting rods, and an externally threaded portion;
an internally threaded bracket means mounted against movement with its threads in cooperative relationship with said externally threaded portion of said handwheel-indicating mechanism;
a first gear means attached to each of said adjusting rods for translation in a direction along its center axis parallel to its geared surface;
each of said handwheel-indicating mechanisms further including
a second gear means in cooperative meshed relationship with said first gear means,
a drive shaft mounting said second gear means,
a third gear means mounted on said drive shaft,
a fourth gear means in cooperative meshed relationship with said third gear means,
a shaft mounting said fourth gear means and additionally having a pointer mounted thereon,
and a dial face mounted to move with said casing in cooperative relationship with said pointer.

2. The slice lip adjustment mechanism of claim 1, further characterized by said slice lip including a profile bar having grooves therein.

3. The slice lip adjustment mechanism of claim 2, further characterized by
means to attach said adjusting rods to said profile bar in a manner to prevent rotation of said adjusting rods and at the same time permit horizontal adjustment of said profile bar allowing movement between said adjusting rods and said profie bar at their point of attachment.

4. The slice lip adjustment mechanism of claim 1, further characterized by
said first gear means having sufficient length along its geared surface along an axis parallel to said surface to allow more than one complete rotation of said shaft mounting said pointer.

5. A handwheel-indicating mechanism comprising
internally and externally threaded portions,
a rod having a threaded portion in cooperative relationship with said internally threaded portion,
a first gear means attached to said rod for translation in a direction along its center axis parallel to its geared surface,
a second gear means in cooperative meshed relationship with said first gear means,
a drive shaft mounting said second gear means,
a third gear means mounted on said drive shaft,

a fourth gear means in cooperative meshed relationship with said third gear means,

a shaft mounting said fourth gear means and additionally having a pointer mounted thereon,

and a dial face mounted to move with said casing in cooperative relationship with said pointer.

6. The handwheel-indicating mechanism of claim **5**, further characterized by

a casing mounted within said handwheel-indicating mechanism,

and said drive shaft passing through said casing with said second gear means mounted on its outer portion and said third gear means mounted on its inner portion within said casing.

7. The handwheel-indicating mechanism of claim **5**, further characterized by

a zero center calibration on said dial face designating calibration from zero in either direction of rotation,

and said first gear means having sufficient length along its geared surface along an axis parallel to said surface to allow more than one complete rotation of said shaft mounting said pointer.

8. A slice lip adjustment mechanism comprising

a top profile bar having grooves therein;

a lower lip forming an exit nozzle in cooperative relationship with said profile bar;

means for adjusting said lower lip in a horizontal direction;

a plurality of non-rotating adjusting rods attached at spaced intervals along the transverse length of said profile bar;

each of said adjusting rods having a threaded upper portion;

a handwheel-indicating mechanism having an internally threaded portion cooperating with said threaded portion of each of said adjusting rods, and an externally threaded portion;

an internally threaded bracket means mounted against movement with its threads in cooperative relationship with said externally threaded portion of said handwheel-indicating mechanism;

a non-rotating first gear means attached to each of said adjusting rods for translation in a direction along its center axis parallel to its geared surface;

each of said handwheel-indicating mechanisms further including

a casing mounted within said handwheel-indicating mechanism,

a second gear means in cooperative meshed relationship with said first gear means,

a drive shaft passing through said casing with said second gear means mounted on its outer portion,

a third gear means mounted on an inner portion of said drive shaft,

a fourth gear means in cooperative meshed relationship with said third gear means,

a shaft mounting said fourth gear means and additionally having a pointer mounted thereon,

a dial face mounted in said casing in cooperative relationship with said pointer,

and a zero center calibration on said dial face designating calibration from zero in either direction of rotation.

No references cited.

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