

Nov. 26, 1935.

M. O. NEILSON

2,022,298

PAPER MAKING MACHINE

Filed April 12, 1934

3 Sheets-Sheet 1

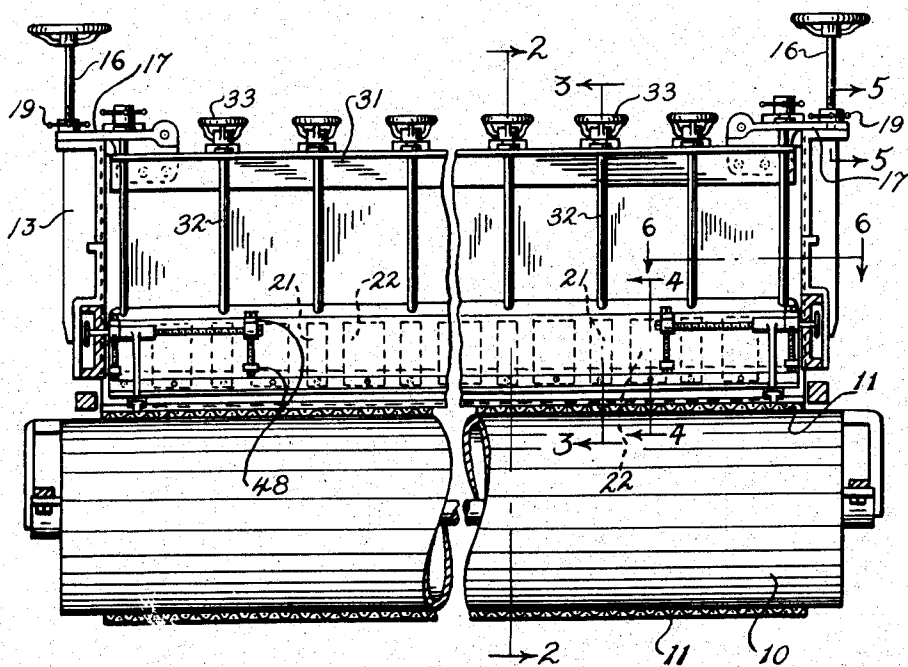


FIG. 1

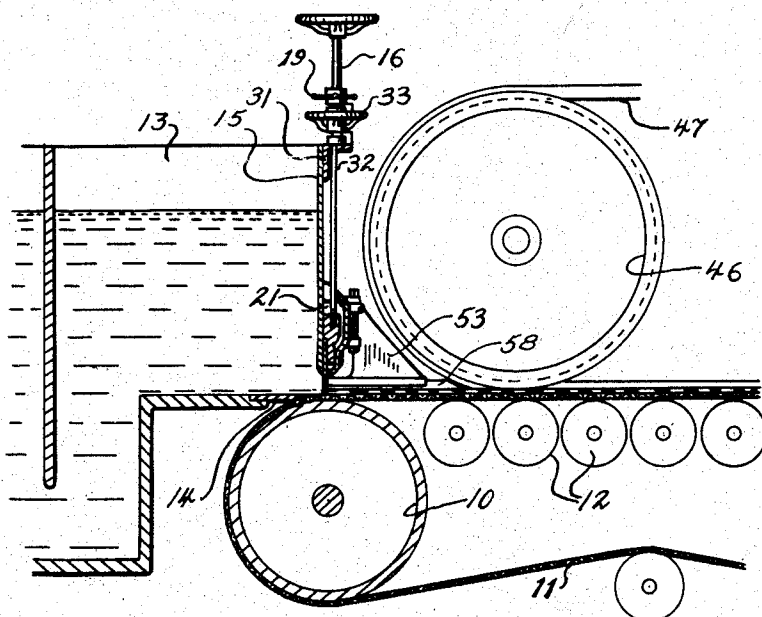


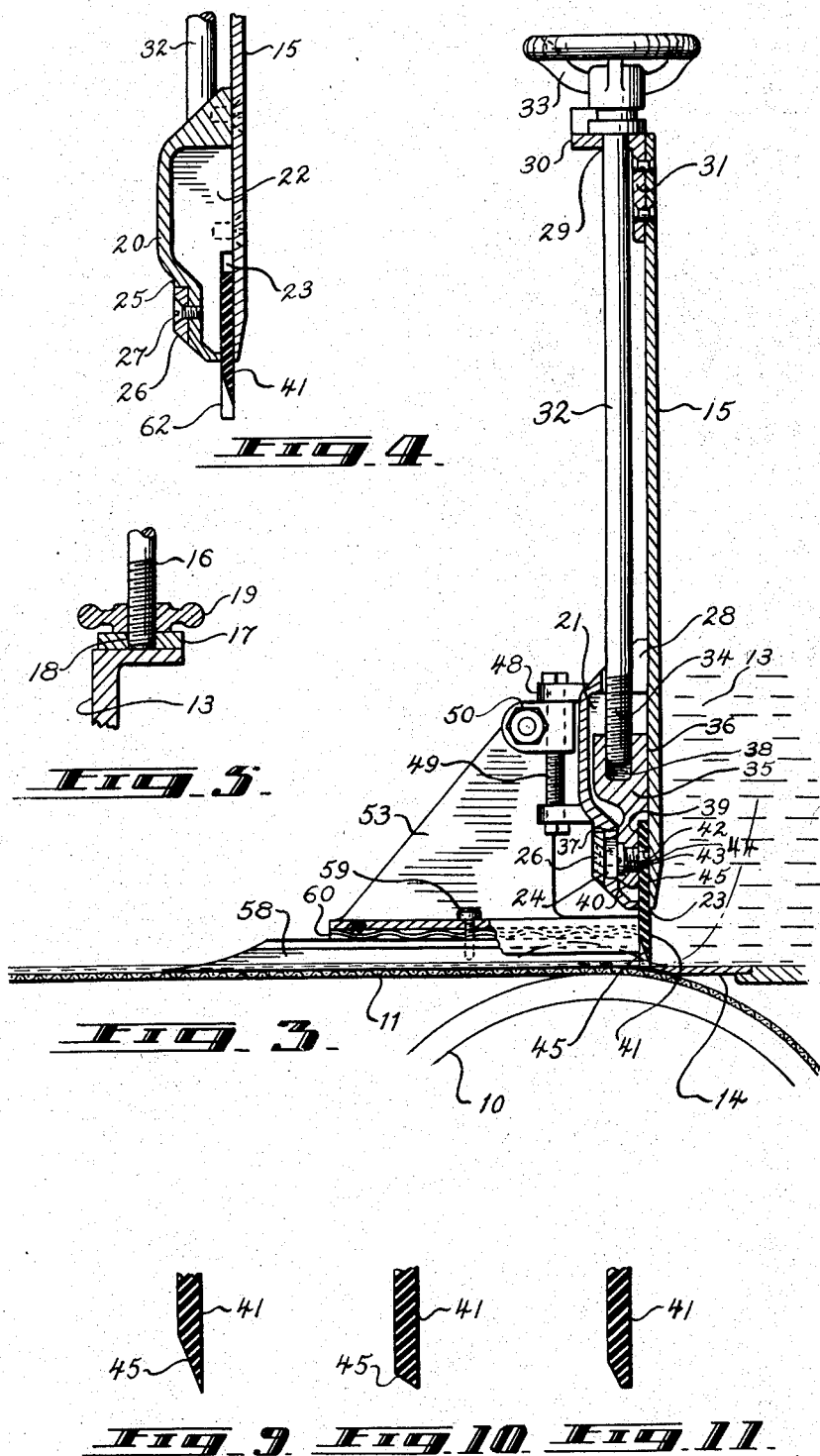
FIG. 2

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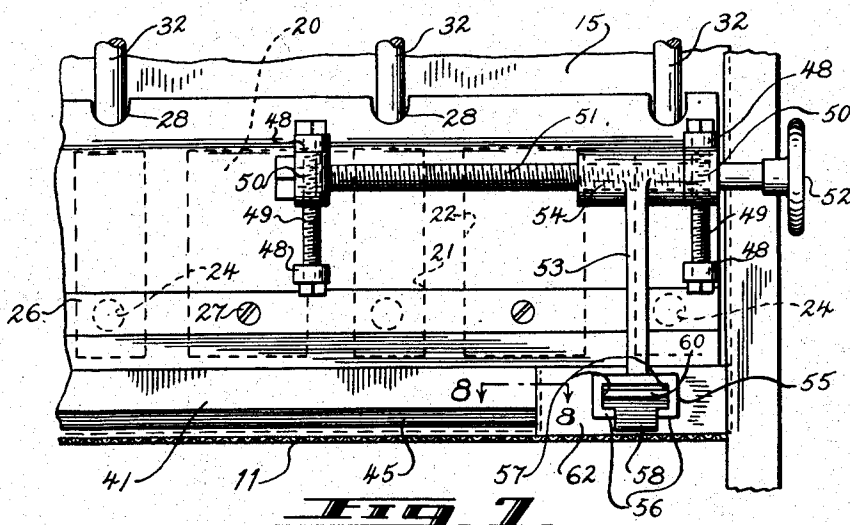
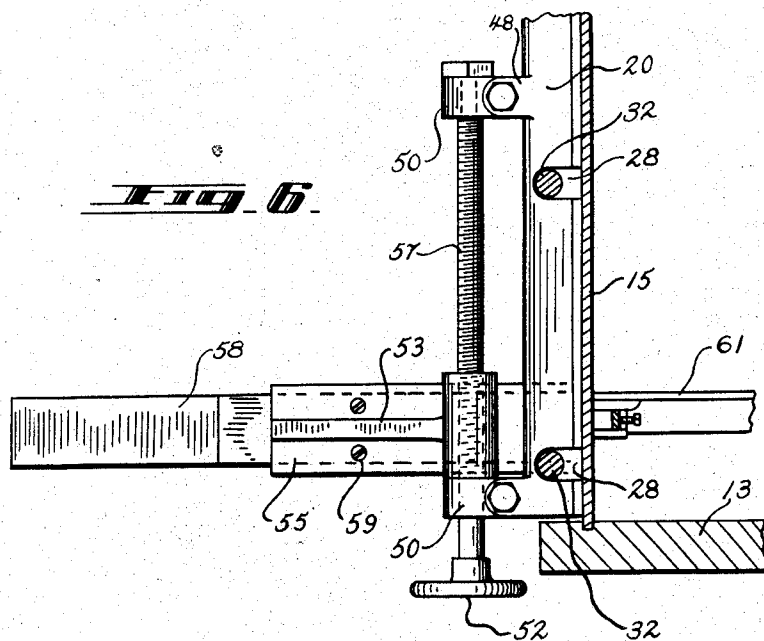
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PAPER MAKING MACHINE

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3 Sheets-Sheet 3



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PAPER MAKING MACHINE

Maurice O. Neilson, Ottawa, Ontario, Canada

Application April 12, 1934, Serial No. 720,270

17 Claims. (Cl. 92-44)

This present invention relates to improvements in a paper making machine and appertains particularly to the mechanism for feeding the stock to the Fourdrinier wire.

5 An object of the invention is to provide a slice for regulating the flow of fibre stock with a view to improving the texture and formation of the paper; perfectly level and of uniform thickness across its width and a sheet that is properly felted and closed up irrespective of the speed of the machine.

15 A further object of the invention is to provide a slice having a knife edged replaceable rubber lip adjustable at a plurality of stations across the slice and that can be made in sections.

20 A further object of the invention is to provide a slice of the character described that is well adapted for use in duplicate or multiple in the making of fine papers.

25 A further object of the invention is to provide a decking in device to regulate the width of the flow of stock including sections of the slice lip and independent laterally adjustable deckles engaging the outer side thereof.

30 A still further object of the invention is the provision of stock feeding mechanism for a paper making machine of the nature and for the purposes described that is characterized by structural simplicity, instant adaptability to a wide variety of uses and being capable of production and installation at reasonable cost is thereby rendered commercially desirable.

35 To the accomplishment of these and related objects as shall become apparent as the description proceeds, the invention resides in the construction, combination and arrangement of parts as shall be hereinafter more fully described, illustrated in the accompanying drawings and pointed out in the claims hereunto appended.

40 The invention will be best understood and can be more clearly described, when reference is had to the drawings forming a part of this disclosure, wherein like characters indicate like parts throughout the several views.

45 In the drawings:—

Figure 1 is a front elevation of my improved stock feeding mechanism;

50 Figure 2 is a vertical longitudinal section thereof as taken on line 2-2 showing also some of the immediately related parts of the paper making machine;

Figures 3, 4, and 5 are each vertical sections on the lines 3-3, 4-4, and 5-5 of Figure 1, respectively;

55 Figure 6 is a longitudinal section on the line

6-6 of Figure 1, looking in the direction indicated by the arrows;

Figure 7 is a detail front elevation of the decking in device shown in plan in section view 6;

Figure 8 is a detail horizontal section taken on line 8-8 of Figure 7; and

Figures 9, 10, and 11 are transverse sections of alternative lips for the slice. (Figures 3 to 11 inclusive are all 3 times enlarged.)

10 In forming a sheet of paper on the Fourdrinier wire of a paper machine, the paper-making fibre or stock, greatly diluted with water (for example 0.5% bone dry fibre), has to flow on to the wire at approximately the same speed as that at which the wire is travelling, in order that a properly felted and closed up sheet of paper may be obtained. This is accomplished by damming up the stock in front of the wire to a height which will give the stock the proper velocity relative to the speed of the wire. The device or dam used for this purpose is called a slice or stock inlet and is so arranged that the stock flows on to the wire between its lower edge or lip and an apron just in front of the so-called breast roll of the wire.

As the paper machine speed increased the height or head of stock behind the slice has to be raised and therefore the slice made higher.

30 The early type of papermaking slice, still in use on many paper machines, consisted of two brass plates overlapping at the center and supported at each end with means for vertically raising or lowering the slice at the ends. In addition, means were provided for moving the slice plates past each other at the center, thus providing a 3-point adjustment vertically of the slice. This type of slice was built up to around 12" in height, permitting a paper machine speed of around 500 feet per minute. As it became desirable to increase the machine speed above this point, the idea was conceived of tilting the wire by raising the breast roll, thus allowing the stock entering the wire part to travel downhill, by this means obtaining the required velocity. This allowed the paper machine to be speeded up to around 800 feet per minute. The inherent defect of this slice was, however, its lack of means of adjustment. As the stock flows from the head-box or pond between the lip of the slice and the apron, eddy currents are formed which cause light and/or heavy streaks in the paper.

To correct this the ends or the middle of the slice are raised or lowered by means of the adjustment screws, and the original slice having

only three points of adjustment, it has in the past always been difficult to make a perfectly level sheet of paper, particularly as the paper machines increased in width and speed. In order to overcome these defects stock inlets of various types were developed. These consist essentially of a vertically adjustable front plate or dam to which a metal lip in the form of a brass plate forming an angle with the horizontal apron or a curved bronze casting is hinged. The lip is adjustable, within the flexible limits of the metal used, across its width by means of screws or jacks, spaced at intervals, which allows any particular part of the lip to be raised or lowered to correct for light or heavy streaks in the sheet. This type of slice has three inherent weaknesses:

A. On account of the converging or nozzle shape of the lip, the velocity of the stock increases as it passes under the slice, and when emerging on the wire rises in a wave or causes a spray to form which seriously interferes with the proper formation of the sheet, particularly at high speeds. Air bubbles are caused by this spray or wave which in some of the largest machines rises so high that the near rolls had to be moved forward and replaced by a splash board to prevent the stock washing right through the wire.

B. The metal lip, lacking the necessary elasticity and resiliency, is difficult to adjust with sufficient accuracy so as to obtain a perfectly level sheet of paper. In addition, the metal in time will take a permanent set, causing the lip, when the pressure on the adjusting screws is released, to take on the shape of a series of undulations instead of returning to its original shape.

C. Due to the curved or protruding lip of the existing improved stock inlets no effective means have been found possible for adjusting or "deckling in" the slice which is a very real disadvantage when the necessity arises of trimming the wire (cutting out worn or unraveled portions of the edge of the wire with the resultant narrowing thereof beyond the usable limits). With the existing stock inlets it is therefore in most instances necessary to put on a new wire, at considerable expense, while yet the body of the original wire is still in good condition for the greater part of its width—and the loss of time incidental to the premature shut-down must also be taken into account.

The slice

In the attainment of the aforementioned objects and overcoming the difficulties encountered up to the present, I provide a machine including the usual breast roll 10, Fourdrinier making wire 11 running around it and supported on its upper side by auxiliary rolls 12 and a head box or pond 13. These parts are shown but being old and well known they are but incidental to this invention. The forward edge of the pond bottom is formed as an apron board 14 delivering onto the wire 11. A slice, comprising a brass or steel plate 15 adjustable vertically at its ends on the side walls of the pond 13 by means of the threaded jacks 16 dams the front of the pond. For this purpose, a laterally extending bracket 17 carried by each of the upper corners of the plate 15 rests on the top of the pond side wall and has a perforated aperture 18 through which the jack 16 threads so that its lower end abuts the top of the pond wall. A suitable jamb nut 19 screws down on the top of the bracket 17.

A bronze casting 20 extends across the full width of the slice 15 on the forward side thereof

with its lower edge flush with the bottom of said slice. Alternate one-side-open chambers 21 and empty pockets 22 are spaced across this casting on the slice abutting side. A narrow vertical longitudinally extending groove 23 is cut in from the bottom of the casting 20 making, with the adjacent side of the slice, a deep channel open to the underside. About two-thirds of the way down the casting steps inwards so that the lower part of the chambers 21 are only about half the depth of the upper portion and centrally of the sides, each of these chambers 21 has a horizontal bore 24 through this stepped in front wall that on its outer side has a horizontal groove 25 wider than the diameter of the bores 24, across its face to accommodate the cover plate 26 held therein by fastening screws 27. The top wall of each chamber 21 is cut in from the slice side to provide a vertical passage 28 and in vertical alignment with each of said passages is a perforation 29 in the overhanging flange 30 of an angle 31 across the top of the slice 15 on its forward side.

The lip

Journalled on the angle 31 are spaced vertical shafts 32, one for each chamber 21, whose upper ends above the angle are equipped with adjusting wheels 33 and whose lower ends 34, entering into the chambers 21, are threaded. Each chamber 21 houses a plunger 35 held against rotation by its flat rear face 36 against the slice 15 and its front lower end 37 of reduced thickness against the stepped in forward wall of the casting 20. A vertically threaded bore 38 in the top for the reception of the shaft 32 permits the vertical adjustment of the plunger on the rotation of said shaft. The rear flat face 36 of each plunger has a horizontal groove 39 cut across it, to a depth equal to the channel forming groove 23 in the bottom of the casting 20, such groove extending into said plunger from the bottom. A tapped perforation 40 with a countersunk seat at its outer end passes centrally through each plunger 35 about midway of the height of the horizontal groove 39. These perforations incidentally are normally in registry with the plate covered bores 24 through the casting 20.

A lip in the form of a vertical rubber strip or plate 41 lies disposed in the channel 23 extending across the entire width of the slice and at spaced intervals fits in the spaced grooves 39 in the plungers 35. This lip is of a density to provide perfect resiliency so as to rapidly regain its true shape when relieved of tension while yet possessing the necessary stiffness and rigidity and is of a thickness equal to the space allowed by the accommodating channel 23 and grooves 39 in the former of which it has a tight sliding fit. Throughout its length as it runs across the slice the lip is provided with a perforation 42, in registry with though slightly smaller than the tapped perforation 40 in each plunger, to receive the reduced end 43 of the countersunk stud 44 carried by said plunger so that the lip is thus minutely adjustable with regard to the apron board 14 at spaced intervals to compensate for inequalities in the flow of the stock. It is to be especially noted in regard to the mounting of the lip that it is adequately supported by the snug fitting machined plungers that allow of no movement longitudinally of the paper machine and the ribs of the casting between each alternate chamber and pocket in addition to the lower edge of the casting 20 that provides support as near its working edge as possible across the entire length of

the said lip. A feature of this lip is that while relatively narrow, its lower side is bevelled on the outer side to provide a knife edge 45 while yet retaining a straight wall on the pond side and in view of the quick detaching and replacing of the lip that the supporting structure described admits of, rubber lips of various bevels, as shown in Figures 9, 10, and 11, for instance can be substituted to suit the velocity of the wire, and/or the nature of the stock.

The deckle

In this paper machine, see Figure 2, the deckle strap pulleys 46 are located in front instead of at the side of the slice and are laterally adjustable. They carry the usual deckle straps 47.

A pair of vertically aligned bearing lugs 48 are provided near the edge and another pair spaced in therefrom, at each end of the casting 20 respectively. These pairs each support a vertically threaded shaft 49, on each of which a laterally drilled bushing 50 is adjustable vertically. The pair of bushings 50, at each end of the casting, carry a threaded horizontal jack 51 rotatable by a hand wheel 52 on its outer end. An angle bracket 53 with a horizontal sleeve extension 54, internally threaded, at its upper end rides on this hand rotated jack. The lower horizontal end of the angle bracket 53, extending out over the wire at right angles to the slice is formed as a channel 55 open to the bottom with the opposite sides provided with inturned and approaching flanges 56. These flanges 56 form cooperating shelves to support the exterior flanges 57 on opposite sides of the rubber deckle 58 carried by the lower side of this angle bracket 53. Centering pins 59 threaded down through the base of the channel 53 enter accommodating perforations in the deckle to prevent its longitudinal displacement while a waved strip of spring steel 60 inserted in the channel 55 and similarly held against dislodgment by the pins 59 bears down on the deckle 58 resiliently holding it close to the wire. The rearward extension of the channel 55 houses the deckle that continues right back against the slice lip while the forward end of the deckle is arcuate to conform with the contour of the pulley encircling strap 17 that it frictionally engages. Thus when a narrow sheet of paper is required or the wire has frayed and has to be trimmed in beyond the original set of the deckle straps, the usual deckle pulleys and their straps (not a part of this invention) can be adjusted inwards to define the edges of the required sheet and this new deckle, for preventing the stock spilling over the edge of the wire from the slice lip 41 to the deckle strap pulley 47, runs inwards on the jack 51 into line therewith.

In such cases a movable pond plate 61 may be employed in the head box 13 but in this instance I prefer to use a sectional lip 41, the outer ends 62 of which, extending from the edge of the slice 15 into the newly determined deckle lines, are rectangular (not bevelled) in cross section. These individually adjustable sections 41 and 62 have an overlapping connection such as the tongue and groove joint 63 shown in Figure 8. With this lip, the outer rectangular sections, closing off the slice outwards of the deckle line, can be lowered tightly against the apron board entirely independent of the central portion.

It may also be pointed out that this adjustable lipped slice can be used readily where duplicate or multiple slices are needed, which is not the case with any other known lipped slice, espe-

cially where the first slice is carefully set to regulate the weight of the resulting paper stock and the subsequent slice or slices are raised higher and serve to spread or even the feeding stock since no material length of the machine is required for this adjustable lip and no spray or rising wave is caused in the flow of stock emerging from it to interfere with the spacing or placing of the next slice.

From the foregoing description taken in connection with the accompanying drawings, it will be manifest that an improved stock feeding mechanism for a paper making machine is provided that will fulfil all the necessary requirements of such a device but as many changes could be made in the above description and many apparently widely different embodiments of the invention may be constructed within the scope of the appended claims without departing from the spirit or scope thereof, it is intended that all matters contained in the said accompanying specification and drawings shall be interpretative as illustrative and not in a limitative or restrictive sense.

Having thus described the invention, what is claimed is:—

1. In a paper making machine, a slice, a housing across the front for the entire width thereof and a vertically adjustable lip therein.

2. In a paper making machine, a slice, a housing running across the entire width thereof and terminating flush with the bottom of said slice and a vertically adjustable lip therein.

3. In a paper making machine, a slice, a casting extending across the forward side thereof, vertically adjustable plungers in said casting and an adjustable lip supported throughout its length by said casting and engaged at spaced intervals by said plungers.

4. A slice for a paper making machine having a vertically adjustable knife edge lip and means for holding the same flat.

5. A slice having a vertically adjustable lip tapered on its outer side and a lateral support for said lip throughout its entire length.

6. For a paper making machine slice, a high thin lip held flat against the slice and vertically adjustable with respect thereto, a lateral support engaging the outer face of said lip and lip adjusting means operable therein.

7. For a paper machine slice, a vertically adjustable, wafer thin, flexible lip, flat on its inner side and tapered on its outer side to provide a knife edge.

8. For a paper machine slice, an independently adjustable rubber lip formed in sections.

9. For a paper machine slice, a rubber lip formed in sections individually adjustable vertically.

10. For a paper machine slice, a rubber lip formed in overlapping sections individually adjustable vertically.

11. A rubber lip for a paper machine slice or the like comprising overlapping sections the outer of which are formed differently from the central.

12. A rubber lip for a paper machine slice or the like comprising overlapping sections the outer of which are flat across the bottom while the inner one, adapted to be raised above the former, has a tapered lower edge.

13. A slice having a sectional lip and a laterally adjustable deckle whose inner end engages said lip.

14. The combination with a slice of a laterally

adjustable frame supported thereon and a single reach deckle carried by the lower side of said frame with its inner end slidably contacting with said slice.

5 15. In a paper making machine, a slice, a vertically sliding lip on the lower edge thereof and a laterally adjustable deckle with its inner end engaging said lip.

10 16. In a paper making machine, a slice, a deckle bracket mounted on said slice and ad-

justable vertically and laterally thereof and a single reach deckle on the lower side thereof engaging said slice at its inner end.

17. The combination with a vertically adjustable slice, lip, or other pond outlet control, of a 5 deckle supported by said slice, etc., and adjustable thereon transversely of the machine in engagement with the adjacent lateral face of the slice etc.

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