United States Patent

[11] 3,622,449

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[21] Appl. No. **777,710**
[22] Filed **Nov. 21, 1968**
[45] Patented **Nov. 23, 1971**

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[32] Priority **Oct. 21, 1968**
[33] **Canada**
[31] **33,147**

[54] **METHOD OF FORMING A CONTINUOUS WEB OF UNIFORM THICKNESS BY APPLYING RECIPROCATING ACTION TO CELLULOSIC FIBROUS STOCK IN A HEADBOX**
2 Claims, 1 Drawing Fig.

[52] **U.S. Cl.** **162/216,** 162/212, 162/291, 162/315, 162/341
[51] **Int. Cl.** **D21f 11/02**
[50] **Field of Search** 162/202, 209, 212, 216, 236, 291, 294, 315, 341, 344, 336, 355, 206, 225; 264/108

[56] **References Cited**

UNITED STATES PATENTS

3,562,108	2/1971	Lopas	162/341
1,928,107	9/1933	Lang	162/212
2,904,461	9/1959	Washburn et al.	162/344 X
3,298,903	1/1967	Hart	162/236
3,477,905	11/1969	Rogers	162/336 X

FOREIGN PATENTS

560,577	4/1944	Great Britain	162/341

OTHER REFERENCES

162–341 Search Card

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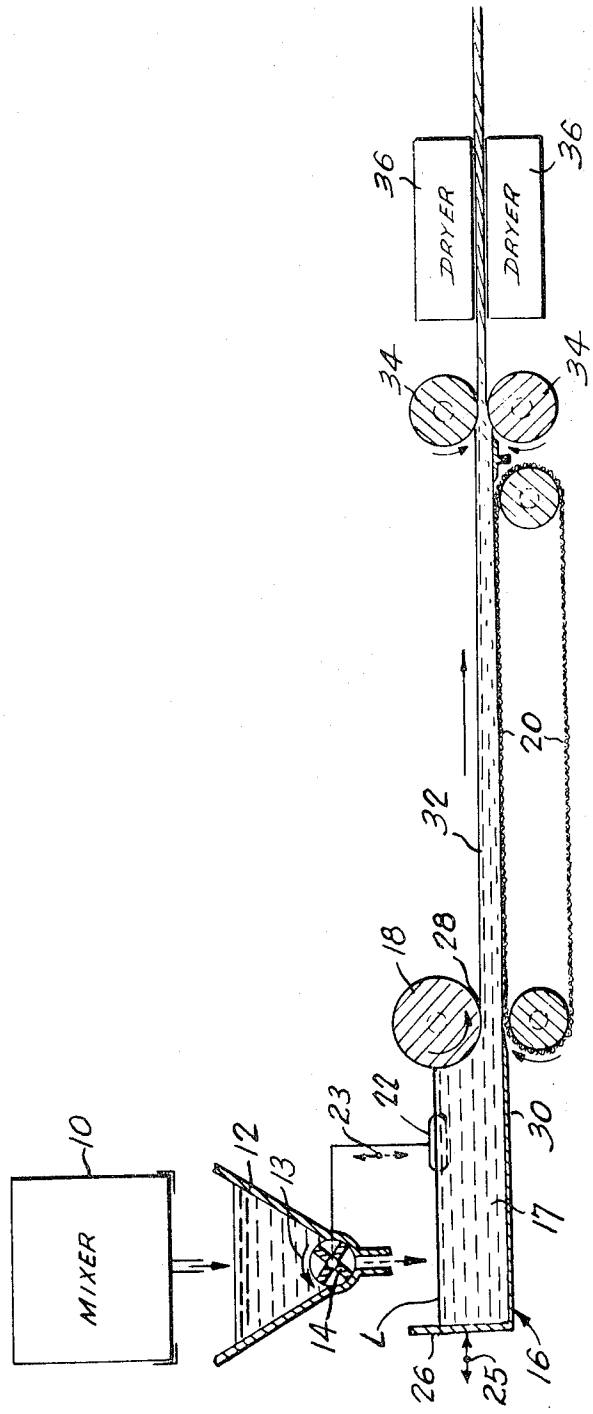
ABSTRACT: The present invention relates to a method for forming a continuous web of substantially fibre-containing stock having a consistency in the range of about 6 to 35 percent by applying a reciprocating action to the stock in a headbox to advance the stock onto a forming surface, said reciprocating action providing substantially the sole means causing said stock to flow from said headbox.



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METHOD OF FORMING A CONTINUOUS WEB OF UNIFORM THICKNESS BY APPLYING RECIPROCATING ACTION TO CELLULOSIC FIBROUS STOCK IN A HEADBOX

The present invention relates to a method and apparatus for the formation of webs, more particularly to the formation of fiber-containing boards from high-consistency stocks.

As is well known, webs such as paper webs or boards are usually formed from relatively low consistency flowable stocks to facilitate forming a sheet with the proper characteristics. With some materials, such as a combination of cellulosic fibers and lightweight mineral aggregates (e.g. expanded perlite), it is necessary to increase the consistency of the forming mixture to prevent separation of the lightweight aggregates from the fibers by flotation. This type of operation uses a consistency of above 3 percent but less than 8 percent and generally about 5 percent. To applicant's knowledge, no forming systems are known for laying webs from stocks having consistencies above 8 percent other than dry forming techniques.

It is thus the main object of the present invention to provide a method and apparatus for forming fiber-containing webs from stocks having consistencies in the range of about 6 to 35 percent.

Broadly, the method of the present invention comprises maintaining a pool of high-consistency stock, positively and intermittently displacing said stock at one end of said pool toward the opposite end by a reciprocating action, flowing stock from said pool at the said opposite end of said pool, metering the thickness of the layer of said stock flowing from said pool thereby to form a substantially uniform web of said stock.

The present invention also relates to an apparatus for forming a web and comprising a head box, means to supply high-consistency stock at a controlled rate to said head box, metering means adjacent the outflowing end of said head box, and means to reciprocate the backwall of said head box whereby said stock flows from said head box and forms a substantially uniform web.

Further features, objects and advantages will be evident from the following detailed description taken in conjunction with the accompanying drawings in which:

The drawing is a schematic illustration of the method and apparatus for carrying out the present invention.

The apparatus of the present invention basically includes a mixer **10**, a hopper **12**, metering valve **14**, a reciprocating head box **16** with a driven metering roll **18** at its outlet end and a forming wire **20** to receive the stock flowing from the head box.

The mixer **10** may be any conventional means suitable for mixing the ingredients from which the board is to be formed.

The hopper **12** contains a supply of stock, and the metering valve **14** regulates the amount of stock flowing from the hopper **12** into the head box **16**.

The valve **14** may be driven by any suitable means schematically designed by the arrow **13**. Preferably sensing means, such as those schematically illustrated at **22**, senses the level L of the pool **17** of stock in the head box **16**, and controls the valve **14** to maintain the level L substantially constant as schematically illustrated by the line **23**.

The head box **16** is one of the most important elements in the combination forming the present invention. The head box **16** as illustrated may simply be an open box into which the stock from the hopper **12** is dumped. Flow of stock from the head box **16** is obtained by reciprocating at least the rear wall **26** and preferably the whole head box including the rear bottom and sidewalls; with some stocks at high consistency. The required reciprocating action may be obtained by any suitable means as schematically designated by the arrow **25**. The bottom of the box may be sloped down toward the outlet end so that the bottom in effect also forms the rear wall of the head box. Such reciprocating movement, it is believed, on the forward stroke positively displaces the stock in the head box toward the outlet end.

The specific amplitude and frequency of the reciprocating motion of the head box is dependent on the feed rate desired and the material being fed. The optimum motion of the head box will vary with resonant frequencies of the specific head box being used. The reciprocating motion is substantially along straight lines rather than on a pronounced elliptical or arcuate orbit so that any point on the reciprocated section of the head box moves in a substantially straight line in one direction during the advancing stroke and in the opposite direction during the return stroke. The angle of the bottom of the head box to the horizontal should generally be approximately 0°, however, some variances, such that the bottom slopes up toward the slice end or down toward the slice end, do not appear to greatly affect the operation of the machine. Similarly, the direction of reciprocation of the head box relative to the horizontal may also be varied to find the optimum for any given machine and material to be processed.

The metering roll **18** governs the thickness of the material extruding from the head box, this roll is rotated at a peripheral speed equal to, or greater than, the speed of the material through the slice **28** to produce a uniform web. In some operations the metering roll **18** may not be an absolute necessity, but is simplifies operation and facilitates the formation of a uniform web.

The wire **20** receives the stock issuing from the slice **28** and travels at a fixed speed relative to the speed of the stock issuing through the slice. Preferably, the speed of the wire will be equal to the speed of the stock through the slice **28** but the wire may move slightly faster or slower to adjust the thickness of the web being laid.

In operation, stock containing sufficient water to provide a consistency of about 6 to 35 percent, preferably about 10 to 20 percent, is metered into the head box **16** by metering valve **14** to maintain the level L substantially constant. The head box is reciprocated to force the stock as a sheet of set thickness determined by the position of the metering roll **18** which rotates at a peripheral speed equal to or greater than the speed of stock through the slice **28** thereby to form a web **32** on the wire **20**. The frequency and amplitude of the reciprocation of the head box, and the angles of the reciprocation, and bottom of the head box to the horizontal are adjusted to obtain optimum operation for the specific material being processed. The web **32** is dewatered on the wire **20** and passes through press **34** and dryer **36**, and is finally cut to the desired size to form boards.

The following are some specific examples of the instant invention as applied to different materials.

EXAMPLE I

A mixture of 70 percent perlite, 25 percent reslushed newsprint and 5 percent asphalt on a weight basis was introduced into a Ribbon blender-mixer **10** and fed to a head box **16** operated under the conditions shown in table 1. In this example the angle between the bottom of the head box and the horizontal was 0°, and the angle between the line of reciprocation of the head box and the horizontal was 10°, so that the head box moved up toward the outlet end.

TABLE 1

	Vibration		Machine speed (ft./min.)	Head box consistency (percent)
	Frequency (cycles/min.)	Amplitude (in.)		
Run No.:				
1	700	3/8	32	14
2	1,275	3/8	55	14
3	1,400	3/8	39	14
4	1,440	1/4	14.5	8.5
5	1,440	1/4	11.4	12.1
6	1,600	1/4	16	13
7	2,000	1/4	20	13
8	2,400	1/4	7	17.7

Boards formed in each of the above runs had similar characteristics to other boards formed using the same feed stock but at the lower conventional consistencies. It will be noted from runs **1**, **2**, **3** that for given conditions where only frequency is varied an optimum frequency for maximum production can be found.

EXAMPLE II

The following mixtures were formed into boards having physical characteristics substantially the same as those found in boards formed from equivalent mixtures using conventional forming techniques. Each mixture *a* and *b* was formed according to the present invention using a consistency of 15 percent, while *c* was formed at 10 percent.

a. A mixture of	
wood fiber	40%
mineral wool	30%
binder (starch)	10%
other materials (fillers etc.)	20%
b. A mixture of	
mineral wool	70%
asbestos fiber	10%
binder (starch)	10%
other materials (fillers etc.)	10%
c. High yield wood pulp fiber per se	

The terms stock or fiber-containing stock, as used in the disclosure and claims, do not include as a principal ingredient materials such as nondefibered wood fragments or bark or the like.

Not all fiber mixtures have been described above; the present invention permits the use of more soluble additives since less water is used and thus recovery of such additives is facilitated.

Modifications will be evident to those skilled in the art without departing from the spirit of the invention as defined in the appended claims.

I claim:

1. A method of forming a continuous web of substantially uniform thickness from an aqueous stock containing cellulose fibers and lightweight aggregate while maintaining the homogeneity of the stock comprising; producing said aqueous stock from cellulose fibers, water, and lightweight aggregate, said aqueous stock having a consistency in the range of 6 to 35 percent, maintaining a body of said stock in a head box, subjecting said body to a reciprocating action positively advancing said stock in one direction whereby said stock flows from said head box onto a forming surface, said reciprocating action providing substantially the sole means causing said stock to flow from said head box, controlling the flow of said stock from said head box onto a forming surface thereby to form a layer of controlled thickness on said surface and to produce a substantially uniform thickness web of said stock.

2. A method as defined in claim **1** wherein said consistency is in range of 10 to 20 percent.

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