Oct. 15, 1946. H. D. STUCK ET AL 2,409,453

JORDAN ENGINE LINING

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FIG. 1.

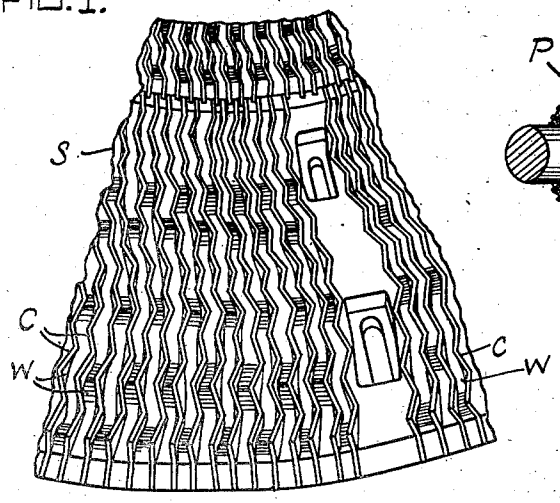
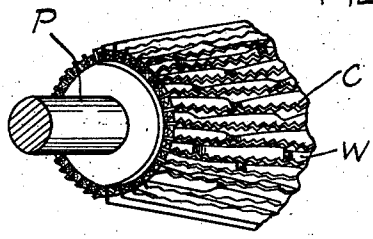


FIG. 2.



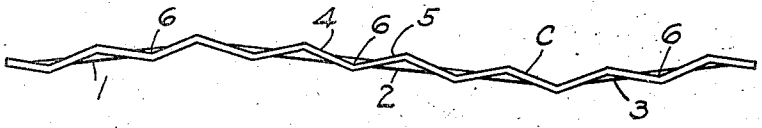


FIG. 3.

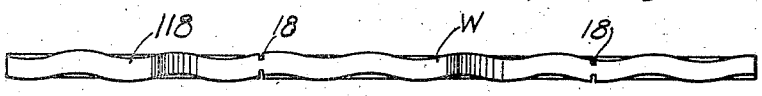


FIG. 4.

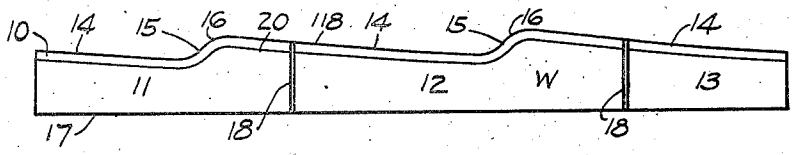


FIG. 5.

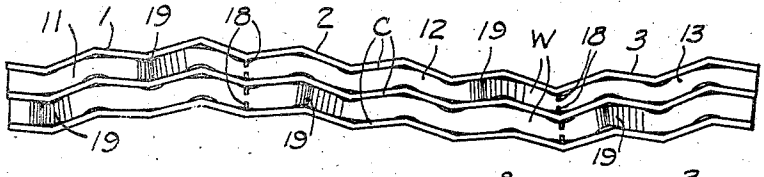


FIG. 6.

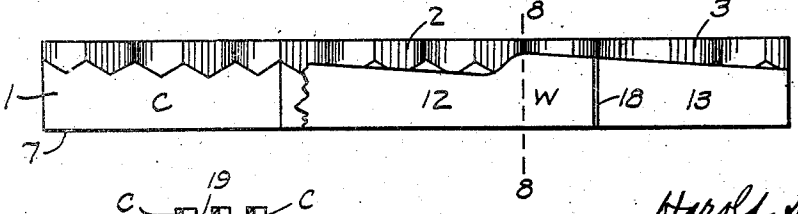


FIG. 7.

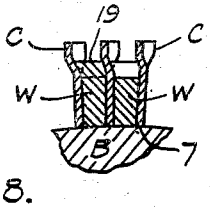


FIG. 8.

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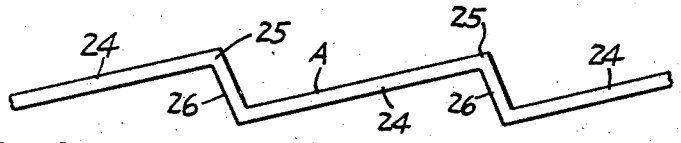


FIG. 9.

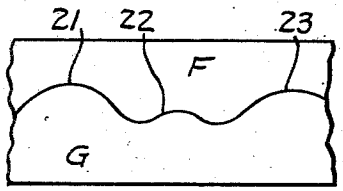


FIG. 10.

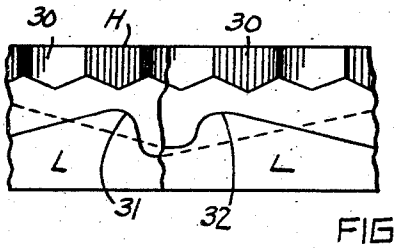


FIG. 11.

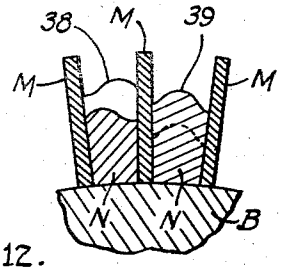


FIG. 12.

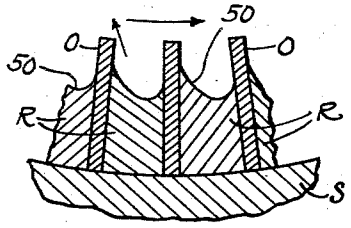


FIG. 13.

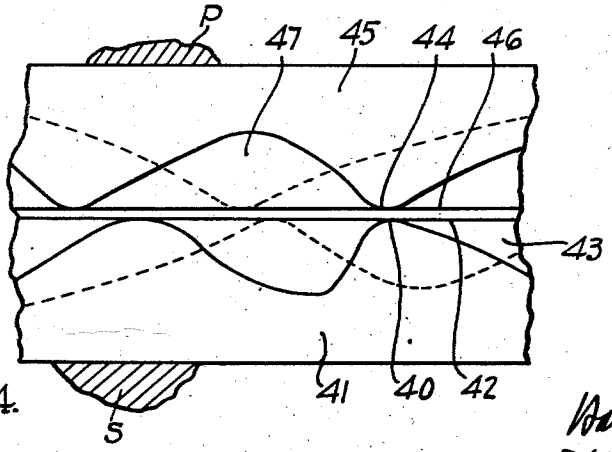


FIG. 14.

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Patented Oct. 15, 1946

2,409,453

UNITED STATES PATENT OFFICE

2,409,453

JORDAN ENGINE LINING

Harold D. Stuck, Andover, and William W. Bolton, North Andover, Mass., assignors to John W. Bolton & Sons, Inc., Lawrence, Mass., a corporation of Massachusetts

Application July 5, 1941, Serial No. 401,066

4 Claims. (Cl. 92—27)

1

This invention relates to Jordan engines and particularly to what is known as the lining of a Jordan shell or the jacket or lining of a Jordan plug. The plug and the shell are both of truncated conical form and generally the knives of the shell are bent near the middle and there are usually two or three sections each with bent filling knives. On the other hand, the bars on the plug are usually straight but are often of different lengths.

In either case however, the knives or bars generally have parallel sides so that what are known as woods or separators which go between them must be of keystone shape in cross section and must be wedge shaped lengthwise. The side faces of the separators converge and the radial faces are usually parallel. One radial face is exposed to the paper stock and the other face rests against the shell or against the plug. We will call the shell or plug the backing.

We are aware that knives have been bent to form sections of substantially equal length and when several sections of shell lining are put together these form a number of cutting or stroking members with all the points of the angles of the bends facing in the same direction which is in the direction of rotation of the plug. This side therefore wears out faster than the other side.

One feature of our device is forming the knives with two bends so that there are two angles and three sections which preferably are of different lengths. This allows the plug to be reversed if desired to equalize the wear.

Our invention is intended particularly for cutting up cotton, potatoes, and other vegetables for use in the manufacture of nitro-cellulose where the fibre must be cut as fine as $^{15}/_{1000}$ of an inch in length.

For this purpose the fibre should not be hydrated to a great extent and with our device we can use slush or paper stock with three or four per cent of fibre and after it has passed through our Jordan engine, it can be dewatered so that it will be thirty or forty per cent.

Our device allows the use of a large number of thin knives whereby we secure more cutting with less hydrating as with our construction the stock does not stand in any recesses so as to cause dead ends but is in constant movement, going rapidly through the machine but at the same time the stock does not run too rapidly either through the channels between the knives or bars or spirally.

The main purpose of our device is to so interrupt and agitate the stock as it passes through the Jordan, usually from the small to the large end,

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that it will all be carried out between the knives of the shell and the bars of the Jordan plug so that there will be no part of it which runs through the machine without being uniformly cut to length.

Another advantage is that with our construction, the plug can be revolved in either direction to get good results as the cutting will be equally effective either way and the channels between knives and bars will not fill up.

We accomplish this purpose by specially bending the knives of the shell; by providing them with a certain type of serrations as distinguished from corrugations or straight edges; and by forming the working faces, or outside radial faces, of the separators in waves or ripples of such a character that the stock cannot run freely through from end to end but on the other hand, cannot lie stagnant in any place.

We are aware that there have been corrugated cutting members such as shown and described in patent to Bolton, No. 2,120,482 of June 14, 1938, but the feature of our present invention is what we will call serrations. By serrations we mean angular alternate bends at the cutting edge of a cutting member each with relatively straight sides substantially longer than the sides of corrugations which are generally formed as short reverse curves. Our serrations are preferably formed with sharp angles rather than with rounded curves.

Another feature of our invention is the provision of separating members which, in the case of the shell filling, are bent to conform to the shape of the cutting knives, whether these knives have one or two bends. Each separating member is formed on the face which is to be exposed, that is on one of its radial faces, with a series of ripples extending outward and inward or radially like waves. Each ripple preferably has a long face at a low angle with the edges of the cutting members and a short face at a high angle therewith. The long face of each ripple in the shell is preferably towards the small end of the shell and the short face towards the large end. By a wave or ripple, we mean a contour of curves, without sharp edges, extending longitudinally and of such a character that the flow of the stock will be retarded but not stopped.

With the separating members for the plug, the long face is preferably towards the large end and the short face is towards the small end. However we can use separators with ripples having faces of equal length and at various angles. Pref-

erably the angles or bends between the faces should be curved rather than sharp.

Preferably also we form the rippled face with a thin strip of material, rippled as described, and glued on so that when worn down, an entire strip can be removed leaving the correct rippled effect for continued service, thus maintaining uniform results through the normal life of the knives.

We prefer to combine separators having rippled or irregular radial working faces with serrated cutting members and, in the case of the shell, with cutting members bent in two places to form three sections of unequal length but we can use these features in various sub-combinations or with other features which may be new or old.

Preferably, as between adjoining or proximate separators, the high spots of the ripples are staggered or offset and in many cases these high spots can come close to the cutting edges of the cutting members to assist in causing the stream of stock to be interrupted and be directed from plug to shell or shell to plug.

Preferably also the transverse as well as the longitudinal faces, of some or all of the separators can be curved to follow the flow of the stock as it whirls between the cutting members or to interrupt it as desired.

In the drawings, S generally represents a Jordan shell and P a Jordan plug. Where it is intended that either can be used, the letter B indicates that we will call the backing for the filling or lining made up of cutting members C and separating members W.

As is customary, there will be one or more assembled axial sections of cutting members and separating members extending around the inside of a Jordan lining or, if desired, around the outside of a Jordan plug.

In Figs. 1 to 7, C represents cutting members made of thin strips of metal, each of which as shown has parallel sides, and each of which is formed with serrations along one edge which is the working edge, each of the serrations being formed by sharp bends at **6** with sides **4** and **5** with a sharp angle **6** between them. These sides **4** and **5** are each preferably at an angle of less than thirty degrees with the axis of the Jordan. The bottom part **7** of each cutting member has parallel sides and has no serrations. This is the side or edge which rests on a backing such as B, S, or P.

If the cutting members are for a shell lining, each is bent in Z shape with three parts **1**, **2**, and **3** of unequal length.

In the drawings, Fig. 1 is an isometric view of part of the end of a Jordan shell showing parts of two conical sections of filling, each provided with cutting members or knives bent in two places and each crimped on its cutting edge, separated by separators which conform to the sides of the cutting members and which also are formed with ripples on the working surface, the high spots of which ripples alternate or are staggered in adjoining channels between the cutting members.

Fig. 2 is an isometric view of the small end of a Jordan plug with straight cutting members and separating members, the cutting member being serrated on their working edges and the separating members being rippled, the ripples in adjoining channels being staggered or alternating.

Fig. 3 is a plan view of a cutting member such as shown in Fig. 1 bent and crimped.

Fig. 4 is a plan view of a separating member

before it is bent and Fig. 5 is an elevation of such a separating member before it is bent.

Fig. 6 is a detail plan view showing three cutting members with separating members between them of the type shown in Fig. 1, and

Fig. 7 is an elevation, with parts broken away of the assembly shown in Fig. 6.

Fig. 8 is a transverse sectional view on the line **8—8** of Fig. 7 but with the cutting and separating members resting on a backing.

Fig. 9 is a plan view of a modified form of cutting member.

Fig. 10 is an elevation of part of a cutting member and a separating member, the cutting member having a straight edge without serrations and the separating member having ripples of modified shape.

Fig. 11 is a fragmentary view similar to Fig. 7 showing parts of two cutting members and parts of two separating members.

Fig. 12 is a view similar to Fig. 8 of an assembly of cutting members and separating members of a modified form.

Fig. 13 is a sectional view similar to Fig. 12 of another modified form of assembly of cutting members and separating members, separating members having a working face of a different shape.

Fig. 14 is a detail view showing the adjoining cutting members of a plug and a shell of another modification of the separating members and showing another relation between the separating members and the cutting members.

W, W, represent the separating members which are usually made of wood or some similar material. These members, if they are for the shell are bent at **11**, **12** and **13** in the same way as cutting members C at **1**, **2**, **3** and are formed from end to end in the usual wedge shape with transverse vertical grooves at **18**, **18**, which extend from the top edge **118** down to the bottom **17** so that each one can be bent to fit the adjoining cutting member.

The top is formed with ripples which extend radially in and out each with a long face **14** and a short face **15** with curves **16**, **16**, between them. The curves are to avoid any sharp corners or depressions in which the slush can settle.

As shown, the top face is a thin strip **10** which rests on and conforms to the ripples whereby the whole top face can be removed when it becomes worn, leaving a new face **20** or so that the depth of the channel can be regulated.

As shown in Fig. 8, the high spots such as **19** of the ripples of adjoining separators need not be opposite to each other but can be staggered.

As shown in Fig. 9, a cutting member such as A having serrations **25**, **25**, which extend all the way from the top to the bottom and which have long arms **24** and short arms **26** can be used if desired.

As shown in Fig. 10, a cutting member such as F which is straight and which has no serrations, can be used with a separating member G with irregular ripples **21**, **22**, **23**.

As shown in Fig. 11, a cutting member such as H which is straight but formed with serrations **30**, **39**, can be used with separating members L, L, having ripples **31** and **32** in which the long slopes of adjoining or various separators can slope in opposite directions and the short slopes can face in opposite directions, the slopes being of various shapes.

As shown in Fig. 12, cutting members such as M, M, of any type resting against any kind of

a backing B can be used with separating members N, N, the working faces of which are not only rippled longitudinally but are formed transversely with irregularly curved faces such as 38 and 39.

As shown in Fig. 13, the working faces 50, 50 of separators R, R, between cutting members O, O, as in a shell S, can be so curved as to conform more or less to the swirling of the stock.

As shown in Fig. 14, the high spots 40 of some of the separators 41 can come up to the cutting edge 42 of cutting members 43 of the shell S and high spots 44 of some of the separators 45 can come up to the edge 46 of cutting members 47 of the plug P. They thus interrupt or deflect the flow of the stock momentarily but only until other cutting and seprating members pass as the plug revolves.

We claim:

1. The combination with a frustro-conical Jordan engine backing; of a plurality of cutting members each member being bent to form sections, each cutting member being formed on its cutting edge with serrations, each serration having a straight edge disposed at an angle of less than thirty degrees with the general direction of the cutting member; and separating members between the cutting members and conforming to the shape thereof up to and including part of the serrations, the separating members being formed on their exposed faces in successive ripples, each ripple having a long face at a low angle with the edges of the cutting members and a short face at a high angle therewith.

2. The combination with a frustro-conical Jordan engine backing; of a plurality of cutting members each member being bent to form sections, each cutting member being formed on its cutting edge with serrations; and separating members between the cutting members and conforming to the shape thereof up to and including part of the serrations, the separating members being formed on their exposed faces in successive radial ripples.

3. The combination with a frustro-conical Jordan engine backing; of a plurality of cutting members; and separating members between the cutting members and conforming to the shape thereof from the bottom up to near the working edges, each separating member being formed on its exposed face with high spots and with low spots forming ripples, the exposed face of each ripple having a contour of curves without sharp edges, extending longitudinally, the high spots in adjoining channels being staggered.

4. The combination of a frustro-conical Jordan engine shell having a lining formed of inwardly projecting metal cutting members, each cutting member being bent to form more than two sections and each cutting member being formed on its cutting edge with serrations, and non-metallic separating members positioned between the cutting members and conforming to the shape thereof from the bottom up to near the cutting edge, a plurality of the separating members being formed on their exposed faces in successive radial ripples; with a frustro-conical Jordan engine plug revoluble inside the shell, the plug having a plurality of cutting members each cutting member being formed on its cutting edge with serrations, and separating members positioned between the cutting members of the plug and conforming to the shape thereof from the bottom up to near the cutting edge, the separating members being formed on their exposed faces in successive radial ripples.

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WILLIAM W. BOLTON.