May 16, 1933. W. H. HERMANN 1,908,842

MACHINE FOR REFINING PAPER STOCK AND PULP

Filed Nov. 25, 1930

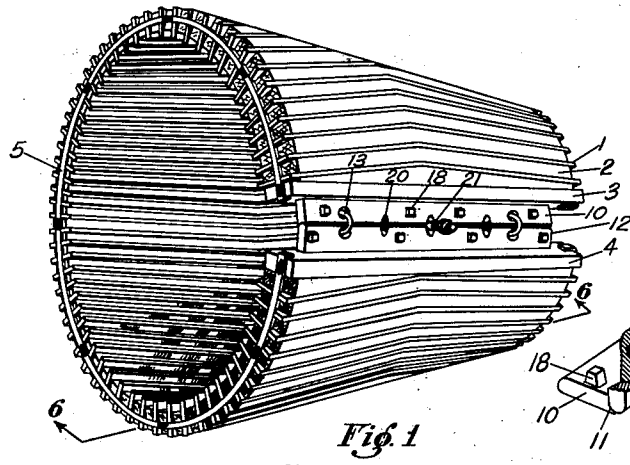


Fig. 1

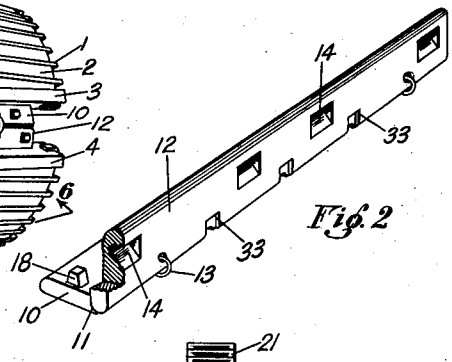


Fig. 2

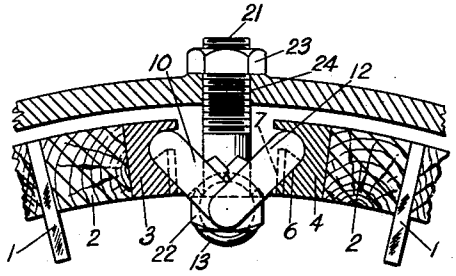


Fig. 3

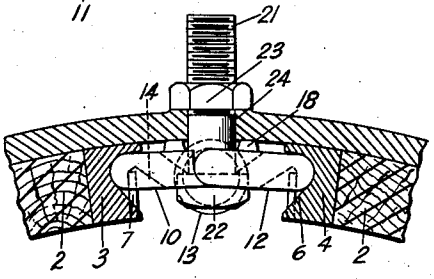


Fig. 4

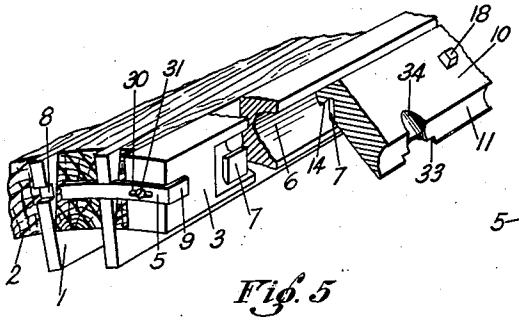


Fig. 5

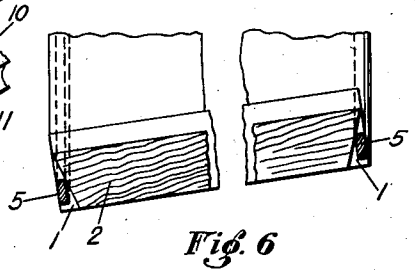


Fig. 6

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UNITED STATES PATENT OFFICE

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MACHINE FOR REFINING PAPER STOCK AND PULP

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My invention relates to machines for refining paper stock and pulp. It has to do particularly with that type of machine embodying a casing of frusto conical form within which operates a plug of frusto conical form, the casing being provided with a liner or filler made up of alternate blocks and knives and the plug being provided with a series of knives mounted upon its periphery in any desired manner.

In the prior art, the practice of providing a preconstructed liner or filler for the casings of engines of this type has been generally adopted. One form of such a filler is made up of a plurality of knives alternating with blocks or bars of wood and preconstructed to form a solid unit which is practically incapable of either expansion or contraction but must be driven into the casing by main force with a consequent danger of distortion of the structure. Another form of such a filler contemplates the assembly of knives and blocks in a unitary structure which is adapted to be expanded after introduction into the casing.

One method of effecting the expansion of the filler after introduction into the casing has contemplated the provision of a longitudinally split filler construction in combination with a wedge adapted to be driven into the longitudinal split in order to effect expansion thereof. This method is subject to several serious drawbacks. For one thing, the application of the force necessary to drive the wedge into the split of the filler inevitably produces a creeping of the filler and involves a substantial amount of labor in order to properly position this filler. Another drawback arises from the fact that, with the use of the wedge driven in from one end of a filler section it is impossible to equally distribute the forces which are being applied in an attempt to expand the filler, this resulting in a filler whose parts are subjected to different stresses at different points therein. Another drawback of the "wedge expanded" filler is the labor involved in removing the filler, since it is necessary to forcibly tear out the wedge before removal can be effected. Another drawback has to do with the necessity of providing a separate anchor bar at some point in the filler to prevent the possibility of this filler rotating about its horizontal axis.

One of the objects of this invention is to provide a filler for casings of the type in question which may be positioned as a unit in the shell or casing of the engine without difficulty and which may then be readily subjected to expanding forces in such a manner that these forces are uniformly applied throughout the filler.

Another object of this invention is to provide a liner or filler which is so expanded after it has been placed in the shell or casing of the engine that there will be no danger of creeping.

Another object of this invention is to do away with the necessity of an independent anchor bar being provided in the filler or liner, thus increasing the possible number of knives which may be utilized in this filler or liner.

Still another object of this invention is to provide a filler or liner for shells or casings of engines of this type which may be readily removed with a minimum of labor.

My invention preferably takes the form of a liner or filler which is constructed in sections that are adapted to be expanded after they are placed in the shell or casing. In order to accomplish this, I use a toggle-lever construction which is operable after the liner section is in position for expanding this liner section by means of force applied uniformly throughout the length thereof. The toggle-lever which I utilize preferably takes the form of a pair of plates linked together and which are disposed at a substantial angle with relation to each other prior to the expanding action. The actuation of these toggle-lever plates is effective to move them into and beyond a position of alignment so as to exert adequate expanding pressure and prevent accidental release. My toggle-lever plates are also provided with means extending through the shell or casing for actuating these plates to exert their leverage action and also for an-

choring them and the liner section to the shell or casing.

The preferred embodiment of my invention is shown in the accompanying drawing wherein similar characters of reference designate corresponding parts and wherein:

Figure 1 is a perspective view of a preconstructed filler unit showing the expanding means located between the separated ends of the filler and in fully expanded position.

Figure 2 is a perspective view of the expanding means, removed from the collapsible liner unit.

Figure 3 is a section taken through a portion of the Jordan casing showing the expanding unit mounted in cooperative relation with the sectional liner and in a position just prior to expansion thereof.

Figure 4 is a view similar to that of Figure 3 showing the expanding means in extended position.

Figure 5 is a detail in perspective of a portion of the filler unit illustrating one of the novel type of end bars and the manner in which it is connected to the expanding unit.

Figure 6 is a section taken on the line 6—6 of Figure 1.

With reference to the drawing, I have shown therein, particularly in Figure 1, a collapsible filler unit for refining engines which preferably takes its initial shape at the factory by forming it in a jig or similar device, not shown, that corresponds with the interior of the frusto conical refining engine casing for which it is intended.

This unit is shown as comprising a plurality of blades or grinding bars 1 that are preferably spaced apart and separated by means of the strips 2 which are preferably made up of some suitable material such as wood. As will be noted, the grinding bars project from the inner periphery of the unit and the unit is completed by the inclusion of the end bars 3 and 4 which are placed against the last woods or spacers on opposing ends of the unit.

The end bars 3 and 4, if desired, may be securely united with the spacers against which they abut, although I have shown them as being held in place by means of the circular retaining hoops 5 that are located at each end of the unit. Furthermore, the bars may be made up of any suitable material, such as metal or wood, and are each provided with a longitudinal under cut groove 6 that extends substantially throughout the total length of their opposing faces.

Each groove 6 is of sufficient depth to properly accommodate, over its whole length, one side of an expanding unit that will be hereinafter described more in detail. In addition, with reference to Figure 5, it will be noted that each groove 6 is provided with a plurality of spaced upstanding tongues 7 that are located adjacent the lower forward edge of the groove and terminate short of the upper edge of the groove to allow sufficient clearance therebetween so that the side of the expanding unit may be inserted in the groove without interference therewith.

Referring again to the circular retaining member 5, it will be noted that this member is substantially rectangular in cross section, Figure 6, and is bent to circular form so as to properly cooperate with the end of the section. This retaining means is preferably made up of a light strong metal although, if I so desire, I may substitute a flexible retaining member therefor. The particular manner in which these retaining members are mounted on the circular ends of the section is such that the woods and knives may be tightened independently thereof as will be hereinafter noted, although the primary purpose of these retaining members is to ensure of the stability of the section and to prevent any lateral or radial movement of the respective knives and spacers.

More specifically, as illustrated in Figures 1 and 5, it will be seen that each retaining member is provided with a plurality of spaced slots 30 that are adapted to receive the screws 31 that may be subsequently screwed into the spacers 2 or, in the case of the two screws located at each end of the retaining ring, into the end bars 3 and 4. The retaining ring is adapted to be positioned in a substantially continuous groove created by the notches 8 formed in the end of each respective knife 1. As will be noted in Figure 6, the woods 2 are each provided with beveled end portions that angle sharply toward the outer periphery of the section. It will be understood that these woods may be provided with squared ends that can be notched in a manner similar to the blades 8 to provide grooves for the reception of the retaining member although, in the form shown, the retaining members merely abut against the angling end portion of the woods.

In assembling the sectional unit at the factory, the woods and knives are arranged substantially in the manner shown in a form or jig and the retaining member is fastened to the end of the section by means of the screws 31. The ends of the retaining members, as at 9, may be bent over so as to engage with the end bar, as shown. However, if the end bars are made up of a metal, the ends of the retaining ring may be spot welded so as to hold them tightly in place but the arrangement illustrated is a satisfactory and convenient one that adequately answers the purpose.

The expanding member which is best shown in Figure 2, preferably comprises

two elongated rectangular pieces of stock of corresponding lengths that are adapted to be joined together, in a manner hereinafter described, and inserted between the end bars 3 and 4 of the collapsible section shown in Figure 1. More specifically, one of the pieces, designated by the numeral 10, is provided on its edge with a groove 11 that extends along one side and throughout the length thereof. This groove is adapted to receive one of the edges of the second piece, designated by the numeral 12, that has been properly rounded throughout its length so as to effect a rotative seating engagement with the groove 11. The two pieces are joined together by means of retaining rings 13 that have been inserted through suitable openings in each of the members so as to ensure that each piece may move about a common axis extending substantially along the line of juncture, without becoming disengaged.

The under surface of each of the pieces 10 and 12 is provided with a plurality of spaced pockets 14 that align longitudinally across the surface of each member and are located a slight distance in from the outer edge thereof. As will be noted, each of these pockets is hook-shaped in cross section. These pockets are spaced apart at approximately the same distance as the upstanding tongues 7 located in the groove 6 of each end bar and such pockets are adapted to receive and cooperate with the tongues, for a purpose to be hereinafter described more in detail, when the expanding member is mounted in the collapsible unit. It will be seen that the outer longitudinal edge of each of the pieces 10 and 12 is rounded throughout its length so as to effect a good seating engagement with grooves 6.

The upper surface of each of the members 10 and 12 is provided with a plurality of spaced upstanding stop members 18 that are adapted to cooperate with the inner surface of the shell or casing when brought into engagement therewith as a result of a spreading of the expansion unit. In addition, the members 10 and 12 are each provided with a plurality of spaced openings that are formed adjacent their cooperating edges and are so disposed as to produce the apertures 20, when such members are joined. These apertures are designed to properly accommodate a bolt 21 having a square head 22 that may be placed in any one of such apertures, preferably the centermost. Each aperture consists in a central opening of constant diameter, slightly greater than the diameter of the bolt, terminating at the lower end in a square mortise 33, adapted to receive the head of such bolt. The opposing end of the bore terminates in the grooves 34 extending crosswise of the central bore and formed in the upper surface of each member. This construction ensures that the two members 11 and 12 may be moved to a position of acute angular relation without binding on the shank of the bolt, and furthermore provides for a seat for the bolt head which prevents such bolt from turning during tightening or loosening.

In mounting the expanding member between the split ends of the collapsible section, the pieces 10 and 12 are moved into a position of acute angular relationship, as shown in Figure 3, and the pockets 14 of each member are brought into cooperation with the tongues 7. This is preferably done prior to insertion of the unit in the Jordan shell. After positioning the unit, the collapsible unit may be inserted in the shell or casing of the refining engine and rotated therein to bring the openings 20 into registry with a plurality of spaced openings 24 in the shell. The bolt 21 may then be inserted through one of the openings 20, preferably the center opening, and through one of the openings 24 in the shell. A nut 23 may be screwed on the threaded shank of the bolt extending above the engine casing and may be turned down until a slight tension is placed on the expanding member.

Further rotation of the nut 23 will draw the cooperating center portions of the members 10 and 12 upwardly toward the shell or casing and force the outer longitudinal edges thereof apart so as to expand the filler unit. In other words, this expanding has a toggle lever action. In this manner, it is possible to produce a force that may be evenly applied to the split ends of the collapsible unit over substantially the entire length of the end bars so as to force the periphery into engagement with the inner surface of the frusto conical casing.

In order to prevent accidental release of the expansion member, the nut 23 is rotated until the members 10 and 12 pass slightly beyond position of alignment. However, the stops 18 immediately contact with the shell and allow but a limited movement beyond position of alignment. It will be apparent that, in the event that the nut 23 should become loose, the contraction of the filler unit will be prevented by the abutment of the stop 18 against the inner wall of the casing. The expansion unit may be readily removed from the shell by merely loosening the nut 23 and removing the bolt, then forcing the pieces of the expanding member inwardly beyond aligning positions. The contracting force set up in the filler during expansion will operate to contract the unit so that it may be readily removed.

It will be understood that I may use one or more of the bolts 21 for drawing the pieces of the expanding member into effective position. In some instances, it is only necessary that one bolt be utilized although

it often happens that a plurality of bolts are more desirable.

As hereinbefore mentioned, the filler unit may be assembled at the factory in a form or jig after which it may be shipped to the paper mill. During assembly, the expansion member may be utilized to move the woods and knives closer together so as to allow the retaining rings 5 to be positioned and the ends bent over to prevent the woods and knives from falling apart. However, it is not necessary that the woods and knives be tightened to the greatest degree, it being only necessary to tighten them sufficiently so that the ends of the ring may be bent over.

However, after the collapsible section has been placed in the engine casing, the screws 31 that hold the retaining ring to the end of the section may be slightly loosened prior to drawing up the spreading unit. It will be seen, that during this expanding action, the woods and knives are free to move closer together independently of the retaining ring after which the screws 31 may again be tightened, if desired. However, this is not necessary since the expanding member operates to wedge the knives and woods tightly together and the purpose of the ring, thereafter, is to prevent lateral and radial displacement of such blades and spacers.

One advantageous feature of this invention consists in the fact that the expanding member and the retaining ring can be used indefinitely which results in an economy heretofore impossible where wedges and retaining rings embedded in metal are utilized. Furthermore, this type of filler unit has an added advantage over prior types of filler units in that more knives may be placed around the periphery by reason of the fact that the use of an anchor bar is obviated. With this novel form of unit, the anchor bar is done away with and the means for spreading the filler unit is also utilized to prevent rotation thereof by effecting a connection with the casing.

An advantageous feature of this invention resides in the fact that I have provided a filler unit for a refining engine casing that may be mounted on the interior of the engine and expanded without the use of driven wedges, keys or other similar devices, the means being of such a nature that it can be operated from the exterior of the shell to apply an even force simultaneously, and in opposing directions on the split ends of the filler unit to expand and position it securely within the shell and to prevent the rotation thereof about its horizontal axis.

Another advantageous feature of this invention consists in the fact that my novel unit for producing the expansion of the filler or liner, after it has been placed in the casing also operates to tighten the woods and knives independently of the retaining rings or cables, which is extremely advantageous especially where the knives and woods have become loosened during shipment from factory to the mill and ensures that, during operation of the engine, there will be no tendency on the part of the woods or blades to raise and lock with the grinding bars of the plug.

Still another advantageous feature of this invention consists in the fact that the elimination of an anchor bar allows the space heretofore occupied by such member to be occupied by additional knives and wood which gives a considerably greater refining surface and increases the efficiency of the engine.

Having thus described my invention, what I claim is:

1. A filler unit for refining engines comprising a body portion and a toggle structure for expanding said body portion.

2. A filler unit for refining engines comprising a body portion carrying blades and having its ends spaced apart, and a toggle structure disposed in between the said spaced ends.

3. A filler unit for refining engines comprising a body portion carrying blades and having its ends spaced apart, said body portion being of circular cross section, and a toggle structure carried by said spaced ends.

4. A filler unit for refining engines comprising a body portion of substantially circular cross section, said body portion having its ends spaced apart, and a toggle structure comprising a plurality of bars extending for substantially the length of said filler unit.

5. A filler for a refining engine comprising a body portion with its ends spaced apart and a pair of bars hinged together and mounted to operate as a toggle upon the spaced ends of said body portion.

6. A filler for refining engine casings comprising a body portion of substantially circular cross section, said body portion having its ends spaced apart and provided with grooves therein, and a pair of hinged bars having their outer edges fitting in the grooves of the said end portions, and means for operating said hinged bars as a toggle lever.

7. A filler for refining engines comprising a body portion of substantially circular form, said body portion having its ends spaced apart, studs carried by said ends, and toggle bar structure hooked over said studs and operable to expand or contract said filler unit.

8. A filler for refining engines comprising a body portion of substantially circular cross section, the ends of said body portion being spaced apart and provided with grooves therein, studs in said grooves, and toggle bar structure hooked over said studs,

said toggle bar structure being operable to expand or contract said body portion.

9. A filler for refining engines comprising a body portion and expanding toggle mechanism, said toggle mechanism being movable past center to effect locking of the same.

10. A filler for refining engines comprising a body portion, an expanding toggle mechanism, said toggle mechanism being movable past center to effect locking of the same, and means for limiting the movement of said toggle mechanism past center.

11. A filler for refining engines comprising a body portion, an expanding toggle member, and means extending through said toggle member for securing said filler to its casing.

12. A filler for refining engines comprising a body portion, an expanding toggle member, and means connected to said toggle member for operating it and also for securing the filler to its casing.

13. In a refining engine, the combination with the shell of a lining unit comprising bars, spacers with an expanding member, said member being operable from the exterior of said shell to produce the spreading of said lining against the shell.

14. In a refining engine, a lining for the shell which comprises a unit adapted to be expanded into engagement with said shell, and means for effecting such expansion, said means being operable exteriorly of said shell.

15. A lining for the casing of a refining engine which comprises a plurality of grinding bars and spacers, grooves in the ends of said knives, a retaining ring for engagement with said grooves, slots in said retaining rings and screws for said slots adapted to be screwed into said spacers.

16. A filler unit for refining engines comprising a body portion, said body portion embodying blade members and spacers, means for securing all of said blade members and spacers in intimate contact with each other, said body portion having its ends spaced apart, an expanding means in between the ends of said body portion, and connected to both ends of said body portion, said expanding means being adjustable to force the ends apart to further tighten said knives and spacers and to force the entire filler unit into contact with the shell in which it is inserted, and means for locking said filler unit to said shell.

In testimony whereof I, hereby, affix my signature.

WALTER H. HERMANN.