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Harris

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[54] BRIQUET BREAKER MEANS

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[52] **U.S. Cl.**.....**425/308,** 425/363, 100/DIG. 6, 44/13, 75/44

[51] **Int. Cl.**.....**B29f 3/00,** B30b 11/00

[58] **Field of Search**.....44/2, 11-13, 29, 44/30; 425/308, 363; 75/44; 100/DIG. 6

[56] **References Cited**

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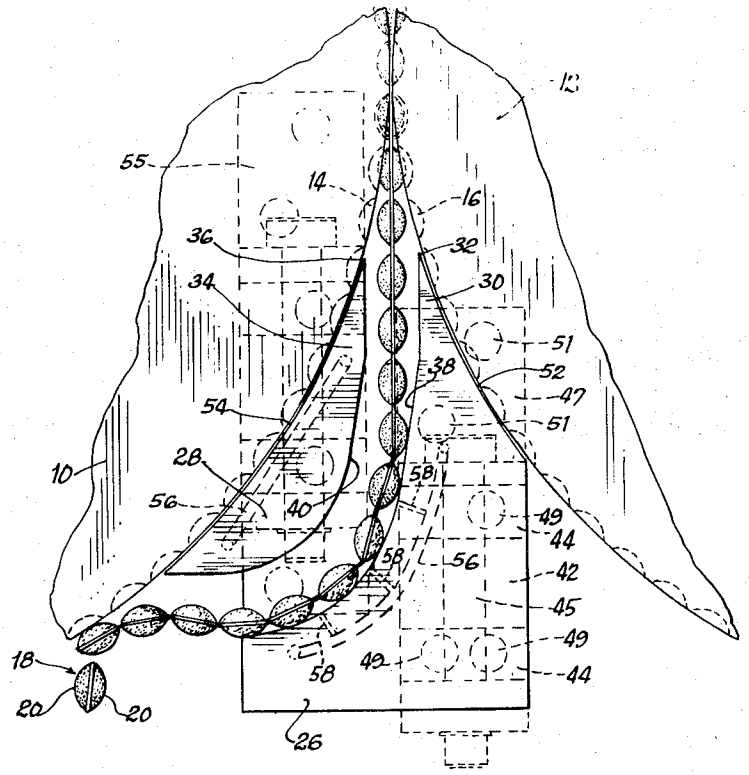
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Primary Examiner—C. F. Dees
Attorney—McDougall, Hersh & Scott

[57] **ABSTRACT**

A briquetting construction of the type employing opposed rolls or other means for forming a length of compacted material. Means are provided for breaking the length of material into separate pieces comprising a shoe having a surface portion located in the path of movement of the length of material. Engagement of the length of material with the surface portion operates to deflect the length of material out of the path of movement with longitudinal stress being developed whereby cracks are formed in the length of material. The material is driven into engagement with a separate surface, preferably the moving surface of one of the briquetting rolls, to achieve fracture.

13 Claims, 3 Drawing Figures



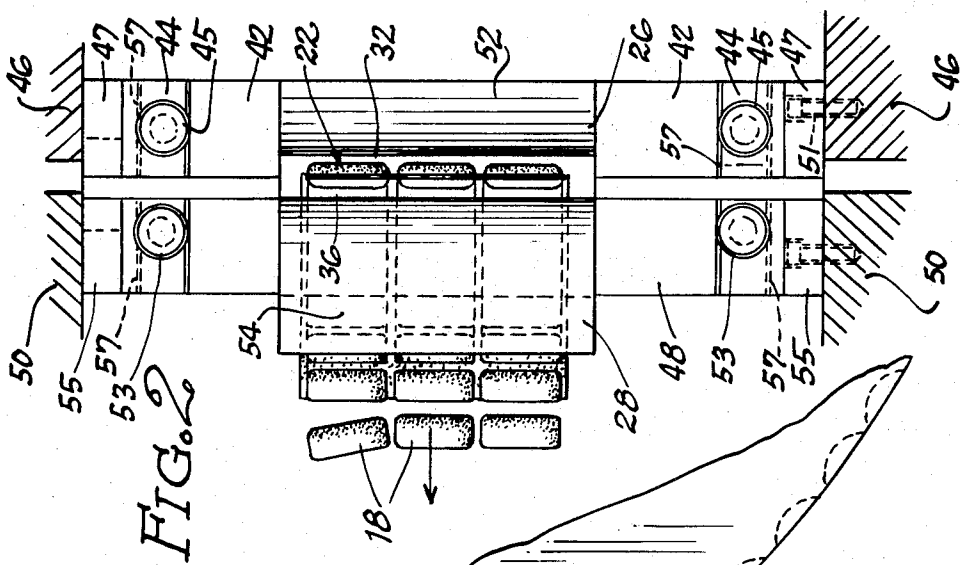


FIG. 2

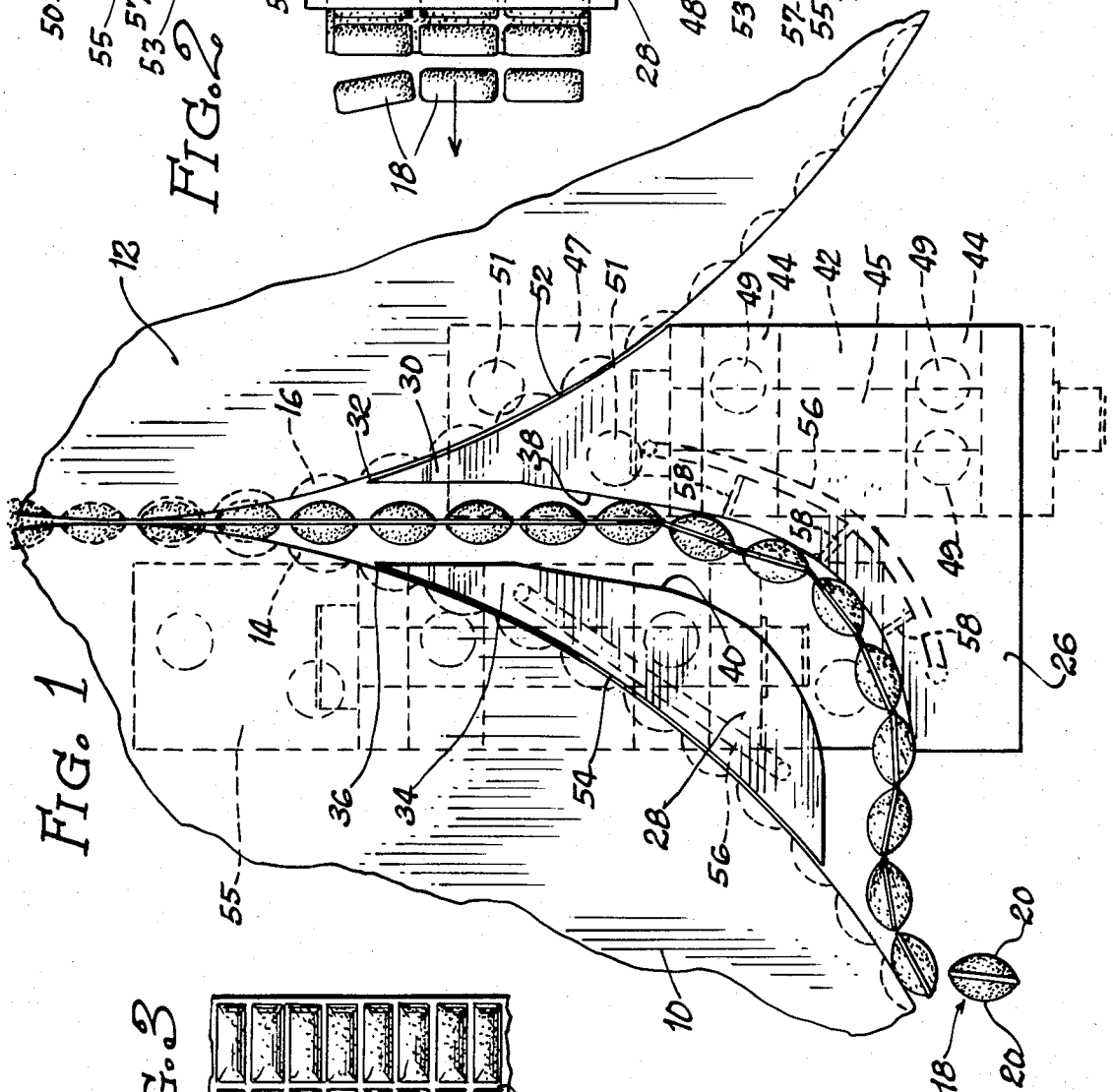


FIG. 1

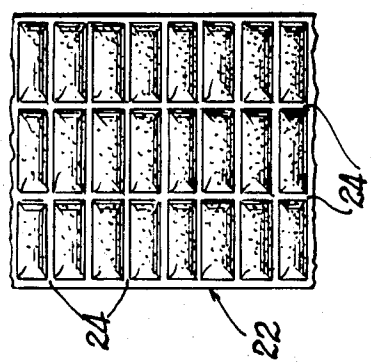


FIG. 3

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BRIQUET BREAKER MEANS

This invention relates to a briquetting construction. This invention is primarily directed to a breaker apparatus which is used in conjunction with the briquetting means for purposes of separating compacted material into individual briquets, or at least into groups of two or three briquets.

In typical constructions, briquetting rolls define opposed pockets with the material being compacted being pressed into a configuration having the contour of the pockets. Briquets may be formed from opposing rolls each having pockets over substantially their entire area whereby the resulting briquets will have contours on both sides. Other roll designs provide substantially flat surfaces on one roll in opposing relationship with pockets on the other roll whereby the resulting briquets will be contoured on one side and flat on the other. In either of these arrangements, a single row or strip of briquets may be formed or several rows in side-by-side relationship may be formed simultaneously whereby a sheet of briquets will be produced.

As the compacted material issues from the briquetting structure, means are preferably provided for separating the compacted material into individual briquets. Breaker means, for example as described in Rohaus U.S. Pat. NO. 3,300,815, include hammers or other arrangements for separating the compacted product in more or less random fashion. The breaking operation is primarily necessary to facilitate handling of the briquets, for example when charging a furnace with the briquetted product.

Problems have resulted in prior art breaker constructions largely because of the conditions under which briquetting operations are carried out. Many such operations result in the creation of large amounts of dust and other contaminants which lead to maintenance problems where the breaker structures employ moving parts. The briquetting operations are also usually carried out at elevated temperatures and, therefore, lubrication of mechanisms and thermal expansion problems become prevalent.

It is a general object of this invention to provide an improved breaker construction for use in conjunction with briquetting equipment.

It is a more specific object of this invention to provide a breaker construction employed in conjunction with briquetting means which form briquets in continuous strips or sheets, the breaker construction being extremely simple in construction and operation whereby the expense of manufacture and use can be minimized and whereby maintenance problems can be significantly reduced when compared with prior art breaker constructions.

These and other objects of this invention will appear hereinafter, and for purposes of illustration, but not of limitation, specific embodiments of the invention are shown in the accompanying drawings in which:

FIG. 1 is a fragmentary, elevational view of a breaker construction in combination with briquetting rolls;

FIG. 2 is a plan view of the breaker construction including its supporting means; and,

FIG. 3 is a fragmentary view of a typical sheet of briquetted material as it appears prior to the breaking operation.

This invention generally relates to a briquetting construction wherein material is fed between opposed

briquet forming means, is thereby formed into a continuous length of compacted material, and is thereafter driven out of the compacting area. The invention is particularly concerned with means for breaking the compacted material into separate pieces whereby the material can be more efficiently handled.

The breaker means comprises a shoe structure which is located in the path of movement of the length of material. This shoe structure operates to deflect the length of material, and the length is brought into engagement with a separate surface for imparting a further deflection in the material. Preferably the first deflection directs the length of material into engagement with a compacting roll with the compacting roll accomplishing the further deflection.

The combination of the deflecting means operates to create longitudinal stress in the length of material resulting in the formation of cracks. The presence of the cracks and the bending action results in the desired separation.

The compacting structure preferably comprises opposed briquetting rolls defining pockets for providing desired contours in the individual briquets whereby the compacting and ultimate use can be accomplished on an efficient basis. The shoe structure of the invention preferably comprises first and second members attached to the axes of the compacting rolls. The shoe members define a channel for directing the length of compacted material along the aforementioned path. The rolls are movable relative to each other in order to allow for operating pressure changes, and the shoe members achieve the same relative movement whereby the length of material will follow the proper path irrespective of the pressure conditions in the compacting operation.

The drawings illustrate a pair of briquetting rolls **10** and **12** defining,respectively,pockets **14** and **16**. In this arrangement, the pockets on one roll will be positioned directly opposite pockets on the other roll at the nip of the rolls. Accordingly, the resulting briquets **18** include contoured body portions **20** which conform with the shape of the respective pockets. It will be appreciated that other roll designs, including designs having flat sides for the briquets, are clearly applicable to the concepts of this invention.

The briquetting rolls illustrated produce a sheet **22** of briquets as shown in FIG. **3**. Thus, three rows of the briquets are formed with web portions **24** connecting the individual briquets. The invention is, however, equally applicable to briquetting operations producing only a single row of briquets.

A breaker construction comprising a first shoe member **26** is located adjacent the briquetting rolls immediately beyond the nip of the rolls. The shoe **26** defines an upwardly extending triangularly shaped portion **30** having a sharp upper edge **32**. A similar upper portion **34** defining a sharp upper edge **36** is provided by the shoe member **28**. The extension of these upper edges to a point near the nip of the rolls provides a convenient means for insuring stripping of the briquetted sheet from the rolls. Thus, if a portion of the briquetted product should stick within any of the pockets **14** or **16**, the edges **32** and **36** will operate to force this material out of the pockets.

The shoe member **26** also defines a bearing surface **38** which curves away from the plane within which the briquetted sheet moves upon issuing from the briquetting rolls. The briquetted sheet is, therefore, driven in bearing contact with the surface **38**, and this results in the sheet moving in a plane located substantially perpendicular to the original plane of movement. A deflection as low as 50° from this plane will, however, provide satisfactory results.

The shoe member **28** defines a surface **40** opposite the surface **38**. These surfaces, therefore, define a channel which confines the moving sheet of briquets. In the event of any tendency of the sheet to buckle upon engagement with the surface **38**, the channel will keep the sheet in the proper path.

The briquetting rolls drive the sheet **22** downwardly with a considerable force. The engagement of the sheet with the surface **38**, therefore, applies forces to the shoe **26** which must be resisted in order to maintain the shoe in position. To accomplish this, the shoe is mounted between transversely extending supporting plates **42**. As best shown in FIG. **2**, the plates **42** extend outwardly on both sides of the shoe with the ends of the plate being connected to supporting blocks **44** by means of pins or bolts **45**. These blocks are in turn secured to vertical plates **47** by means of bolts **49**, and the plates **47** are secured to the bearing blocks **46** by means of bolts **51**. The bearing blocks **46** are associated with the roller **12**. Similarly, the shoe member **28** is mounted between plates **48** which are secured by means of pins **53** and vertical plates **55** to bearing blocks **50** of the roller **10**.

As described, for example in Stillman U.S. Pat. NO. 2,621,364, Komarek, et al. U.S. Pat. No. 2,977,631, and Komarek U.S. Pat. No. 3,134,156, the briquetting rolls are preferably supported by bearing blocks which are movable in response to pressure changes during the briquetting operation. It has been found that the shoe members of this invention are most advantageously utilized where they are attached to the bearing blocks so that the shoes will follow the movements of the rolls. Thus, the concave surfaces **52** and **54** of the shoe members **26** and **28** will maintain a constant spacing with reference to the briquetting rolls. There is, therefore, no danger of the sheet or portions of briquetted material moving into these areas.

The design of the shoe members and the mounting of these members for movement with the briquetting rolls is also of extreme importance for purposes of reducing jamming and clogging problems. In the event that the sheet should buckle or if there are any other problems which increase the pressure between the shoe members, then the shoe members will be forced apart thereby automatically relieving the pressure. This automatic separation of the shoe members due to the connection of the members with the briquetting rolls, serves to provide additional space for movement of the sheet thereby relieving the conditions which led to the jamming or clogging problem.

Preferably, the ends of the plates **42** and **48** are slightly spaced from the respective vertical plates **47** and **55** as shown at **57**. The pins **45** and **53** serve in the manner of hinge pins whereby a degree of relative movement of the plates is allowed. As the gap between the bearing blocks changes, some pivoting around the pins is allowed to accommodate differential stresses, small misalignments, etc. This minimizes the possibility of excess strain on the shoe members. Obviously, other means for attaching the shoes which permit relative movement between the shoes and bearing blocks are available.

The deflecting of the briquetted sheet by the surface **38** of the shoe member **26** operates to drive the sheet into engagement with the roll **10**. This engagement then results in fracture of the sheet whereby individual briquets, or at least a group of only two or three briquets will result. Where the sheet remains intact until engagement with the roll **10**, there is a highly effective dual application of force which leads to the advantages of the invention. The initial force application results when the vertically moving sheet engages the surface **38**. A substantially longitudinal or compressive force is developed along with a bending force. This combination is believed to create at least minute cracks in the sheet, these cracks being located almost exclusively in the web portions between the individual briquets. In some instances, the combination of the compressive and bending forces will lead to fracture of the sheet whereby pieces will fall off beyond the end of the surface **38**. Whenever a tougher product is involved, however the engagement of the sheet with the roller **10** provides a highly effective means for breaking the sheet into usable pieces.

The breaker device of the invention is extremely satisfactory from an efficiency standpoint. The device is very simple in design since it does not require any moving parts, or any motors or other driving means. The operating forces which accomplish the breaking operation are developed solely from the normal operation of the briquetting apparatus in that the briquetting rolls normally drive the sheet so that the presentation of a barrier in the path of movement of the sheet will automatically develop the desired forces. Similarly, the use of one briquetting roll for fracturing a sheet into pieces represents the use of a structure which is available in the normal course of the briquetting operation.

The shoe members may be formed of any adequate structural material preferably provided with a hard wearing surface. The invention contemplates the briquetting of a wide variety of materials including aluminum, brass, stainless steel, steel, and iron ore in the form of fines, chips or turnings. In many instances, these materials are handled at elevated temperatures up to 1,500° F. and, therefore, the uncomplicated nature of the illustrated structure proves to be a distinct advantage. If desired, water cooling channels **56** may be formed in the shoe members or in the supporting structures to assist in withstanding the elevated temperatures. Lubricant could also be supplied to the shoe members by means of such channels or through separate channels with the lubricant then being fed through passages **58** to the surfaces **38** and **40**.

It will be understood that various changes and modifications may be made in the above described constructions which provide the characteristics of this invention without departing from the spirit thereof, particularly as defined in the following claims.

That which is claimed is:

1. In briquetting and compacting constructions wherein material is fed between opposed forming

means and is thereby formed into a continuous, moving, length of compacted material issuing from said forming means, the improvement comprising means for breaking the compacted material into separate pieces, said breaking means comprising a shoe positioned beyond the briquet forming means, a surface portion of said shoe located in the path of movement of said length of material, engagement of said length with said surface portion operating to deflect said length out of said path of movement, and whereby longitudinal stress is developed in said length between said forming means and said surface portion, and including moving engaging means located in the path of movement of said length after deflection by said surface portion, said moving engaging means imparting a further deflection to said length thereby breaking said length into pieces.

2. A construction in accordance with claim 1 wherein said forming means comprise opposed briquetting rolls, the axes of said rolls being movable horizontally relative to each other, said shoe being secured to one of said rolls whereby the relative position of said shoe and the other roll will change upon relative horizontal movement of the rolls.

3. A construction in accordance with claim 2 wherein a second shoe is associated with the other roll, said second shoe having a surface portion opposite said surface portion of said first mentioned shoe with a guide channel for said length of material being defined between said surface portions.

4. A construction in accordance with claim 2 wherein said shoe includes an upwardly extending portion defining an upper edge positioned immediately adjacent said one roll, said edge serving as a stripper means to insure separation of said length of material from said one roll.

5. A construction in accordance with claim 4 wherein said second shoe defines a corresponding upper edge to provide a stripper means for said other roll.

6. A construction in accordance with claim 1 wherein said forming means comprise a pair of briquet forming means comprising a pair of briquetting rolls, and wherein said moving engaging means for said length of material comprise one of said rolls, said surface portion of said shoe deflecting said length of material into engagement with said one roll.

7. A construction in accordance with claim 6 including a second shoe positioned opposite said first shoe with a surface portion of said second shoe combining with said surface portion of said first shoe to provide a guide channel for said length of material, said guide channel deflecting said length of material from a path of movement in a plane extending vertically downwardly through the nip of said rolls to a path of movement between 50° and 90° relative to said plane whereby said length of material is driven into contact with said other roll.

8. A construction in accordance with claim 7, wherein said rolls are movable horizontally relative to each other, said first and second shoes being mounted on said rolls for movement with said rolls.

9. A construction in accordance with claim 8 including transversely extending brace means for supporting said first and second shoes, said brace means operating to resist the downward longitudinal forces which are transmitted through said length of material by said rolls, said brace means thereby maintaining said shoes in position for the deflection and breaking of said length of material.

10. A construction in accordance with claim 3 wherein conduits are defined by said shoes for the passage of coolant.

11. A construction in accordance with claim 3 wherein conduits are defined by said shoes for the passage of lubricant, and including said passages extending from said conduits to the opposed surface portions of said shoes for feeding lubricant to said surface portions.

12. A construction in accordance with claim 3 including transversely extending brace means for supporting said first and second shoes, said brace means operating to resist the downward longitudinal forces which are transmitted through said length of material by said rolls, said brace means thereby maintaining said shoes in position for the deflection and braking of said length of material, means connecting said brace means to said rolls for thereby securing the shoes to the rolls, said connecting means permitting relative movement between said brace means and said rolls during operation of the construction.

13. A construction in accordance with claim 12 wherein said brace means are connected to said rolls by means of pivot ends, the pivot axis of said pins being substantially parallel with the path of movement of said length of compacted material.

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