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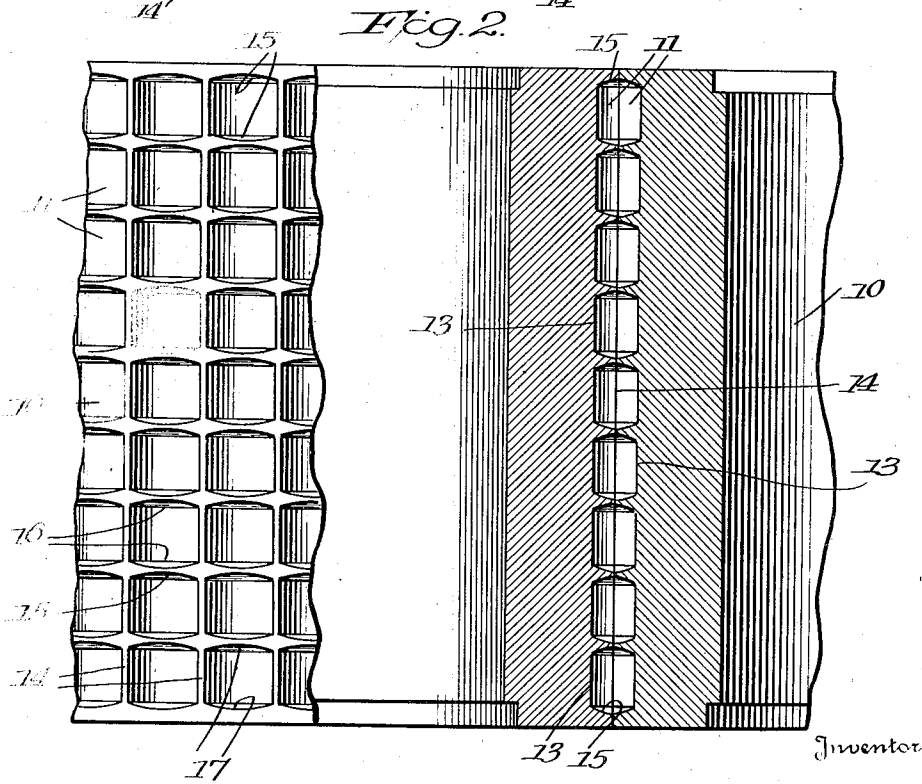
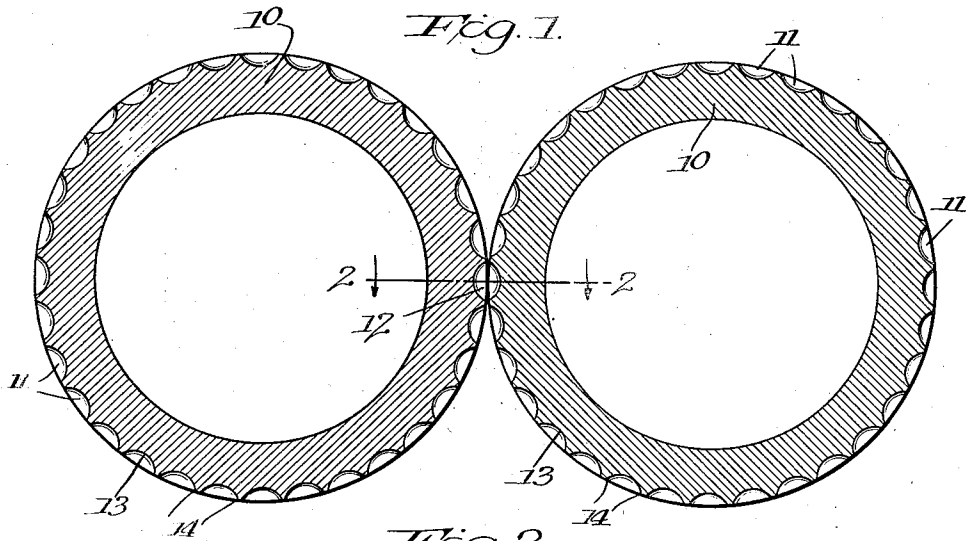
G. KOMAREK

2,203,200

METHOD OF MAKING BRIQUETTING ROLLS

Filed July 15, 1937

2 Sheets-Sheet 1



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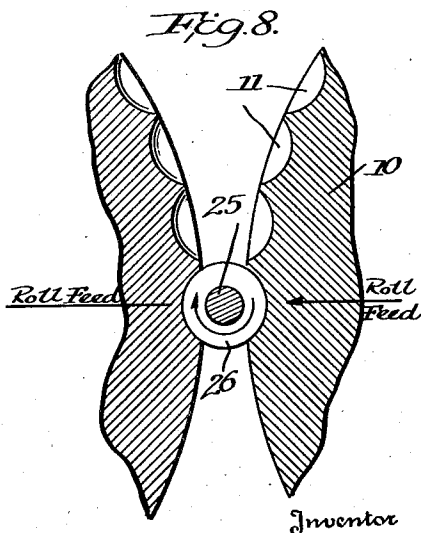
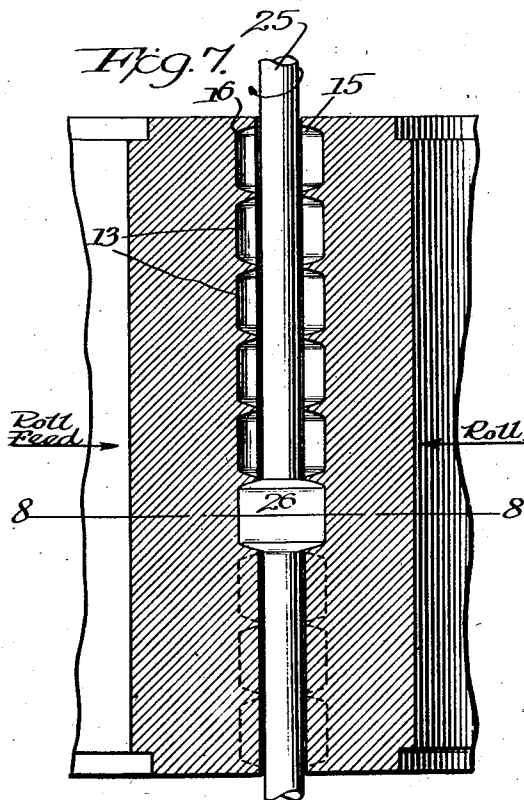
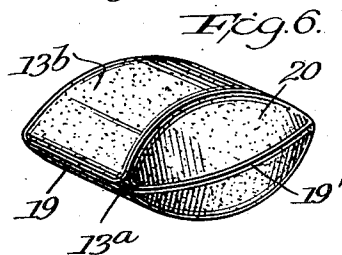
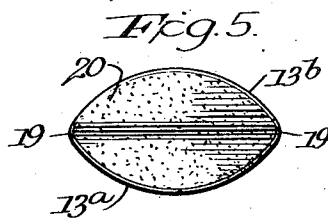
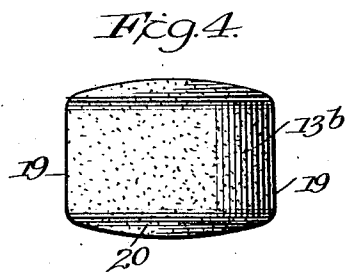
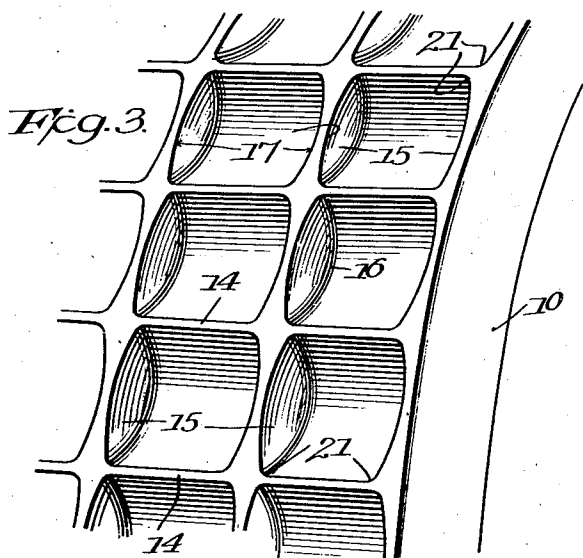
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METHOD OF MAKING BRIQUETTING ROLLS

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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METHOD OF MAKING BRIQUETTING ROLLS

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Application July 15, 1937, Serial No. 153,851

5 Claims. (Cl. 76—107)

The present invention relates to the art of briquetting and is more particularly directed to the rolls for molding briquettable material into desired shapes.

Heretofore, and at the present time, these rolls have had molding pockets of a character to produce two general shapes of briquettes, (a) the over-stuffed pillow type; and (b) a more rounded type.

Because of the weakness presented by having four sharp corners in the over-stuffed pillow type of briquette, whereby objectionable fines are produced during handling and storing, this briquette shape is not regarded as preferable. The industry has therefore turned to the more abrasion resistant rounded type in which such sharp, weak corners are eliminated.

The manufacture of the rounded type of briquette has been attended with the necessity, that the molding pockets of the rolls must be disposed in staggered relation in order to avoid excess dead or void spaces on the surfaces of the roll between the pockets. However, with such expedient, over-compression or under-compression of the briquette material occurs, with the result that (1) the briquettes lack uniformity, (2) splitting or clam shelling frequently develops in the case of over-compression, and (3) the briquette structure is weak and is not firm and solid where there has been an insufficient amount of compression.

The present invention aims to efficiently produce briquettes of the rounded type and to overcome the aforesaid difficulties by providing rolls having the molding pockets arranged in transverse rows circumferentially of the rolls. That is to say, the pockets as distinguished from being staggered, are disposed transversely side by side in alignment across the periphery of the roll. At the same time, of course, the pockets are aligned in rows circumferentially of the roll. This result is attained without presenting objectionable void or dead space on the roll surfaces between the pockets.

With this arrangement, the pockets are in such alignment that at any time, all of the pockets in any transverse row are similarly subjected to the same amount of compression along the same transverse line. This enables the production of briquettes of uniform quality, which do not develop clam shelling and possess the desired firm character.

I am familiar with the fact that in the manufacture of the over-stuffed pillow type of briquette, it is customary to form the square edged pockets in transverse alignment on the rolls, and

that to accomplish this result it is necessary in order to form a pocket, to resort to two or more cutting operations. The expense of this, and the difficulty of producing precisely accurate pockets which, of course, must register in the respective rolls for molding purposes, will be appreciated. Moreover, as will be later explained, the making of pockets for rounded type briquettes is a distinct problem.

The present invention further comprehends a method of forming pockets of the required rounded contour in the rolls by one cutting operation. That is to say, I use a single cutting tool having the precise configuration and dimension ratio which it is desired that the pocket finally possess and impart to the briquette.

The cutting operation is conducted preferably by a rotating cutting member working simultaneously upon a pair of opposed rolls. Pairs of mating pockets may thus be cut successively by moving the cutter transversely across the rolls, or two or more pairs may be cut simultaneously. In this manner, pockets of uniform shape and dimension are produced in the respective rolls and in the proper relation to register for molding purposes. The rolls with the pockets therein may be formed by casting, if desired.

The advantages of rolls having transversely aligned pockets and formed by a single cutting operation will be apparent. However, these results are only attained by a critical control of the curvature of the bottom and sides of the individual pockets. That is to say, my rounded type of briquette has a curved top and bottom meeting respectively at two ends of the briquette along substantially straight median lines and the two sides of the briquette are substantially elliptical in construction and are convexly curved both longitudinally and transversely. I have discovered that if the ratio of the radii of curvature between the radii at the convex sides of the briquette (the longitudinal and transverse radii of curvature at each of the convex sides being substantially the same), and the radii of curvature of the top and bottom of the briquette, (the radii curvature of the top and bottom of the briquette being substantially the same) is maintained at substantially two to one, that it is possible to (1) transversely align the pockets without having objectionable dead or void space on the surface of the rolls; and (2) form the pockets by a single cutting operation either successively or simultaneously. This determination of the ratio of radii of curvatures of the briquette and pocket for making the same affords therefore

the solution of the problem of eliminating (a) the heretofore regarded necessary expedient of staggering the pockets for making rounded briquettes, and (b) the objectionable over-stuffed pillow-shaped type of briquette. It also (c) enables for the first time, the forming efficiently of the preferred rounded briquettes of uniform quality without the difficulties heretofore encountered.

10 In order that the invention may be fully understood, I have illustrated in the accompanying drawings a preferred type of briquette, briquette roll and method of manufacture, which may be modified in various ways without departing from the spirit of the invention.

Referring to the drawings,

Figure 1 is a diagrammatic side elevation of a pair of briquette rolls formed with pockets in accordance with this invention;

20 Figure 2 is a combination view showing at the left the surface of a roll in elevation, and at the right in transverse section (on the line 2—2 of Figure 1) the registering engagement of the pockets at the point of tangency of the rolls, for compressing and molding the briquette material;

25 Figure 3 is an enlarged perspective view of the surface of a roll;

Figure 4 is a top elevation of a rounded briquette made in accordance with this invention;

30 Figure 5 is an end elevation of the briquette of Figure 4;

Figure 6 is a perspective view of the briquette of Figure 4;

35 Figure 7 is a transverse sectional view showing the manner in which pockets are formed in a pair of rolls; and

Figure 8 is a vertical sectional view illustrating how the pockets are formed in a pair of rolls and taken on the line 8—8 of Figure 7.

40 Referring to Figure 1, I have illustrated at 10 a pair of similar briquette molding rolls which are suitably supported for rotation at predetermined speeds in the usual manner to perform the briquetting operation. These rolls are provided in their peripheries with rows of registering pockets 11. The pockets extend in both transverse and circumferential lines as shown in Figure 2, and the pockets of one roll are in registering relation precisely with the pockets of the other roll as shown at 12 in Figure 1.

50 Any usual briquettable material, e. g., a combustible mixture, is continuously fed downwardly as indicated by the arrow into the upper bight of the rolls and is thus supplied by gravity to the pockets and molded to briquette form as the rolls rotate.

55 As shown in Figures 3 and 8, the bottoms 13 of the pockets are continuously curved inwardly and downwardly from one straight end edge 14 at the roll surface to the other. The sides 15 are semi-elliptical in contour and are convexly curved both longitudinally and transversely outwardly and upwardly from the bottom. At their inner or bottom edges, the sides merge with the bottom throughout its length on a curve as shown at 16, while their outer edges are outwardly curved at the roll surface as shown at 17. In this manner, and referring to Figures 4, 5 and 6, it will be apparent that the briquette will have a desirable rounded form, and will be devoid of sharp edges or weak square corners.

70 As heretofore stated, the radius of curvature of the bottoms 13 of the pockets (which form the top and bottom molding surfaces) has a direct relation to the radii of curvature of the convexly

curved sides 15 to form strong, firm and uniform, abrasion resistant briquettes devoid of any sharp, weak portions. That is to say, I have discovered that this critical relationship is observed, permits pockets for molding the rounded type briquettes to be arranged side by side in transverse rows (and circumferentially in line) whereby (1) at any time, the same portions of the briquette material in any transverse row of pockets are subjected to equal pressure, (2) the pockets may be cut to the required shape and dimension by a single cutting operation, and (3) objectionable dead or void surface is avoided. I have found the ratio between the radius and curvature of the radii of the transversely and longitudinally curved sides 15 and the radius of curvature of the bottom 13 to be critical and substantially two to one. That is to say, the radii of curvature of the convexly curved sides 15 should be at least twice that of the radius of curvature of the bottom 13. Rolls having the pockets constructed and arranged in the manner described for making the rounded type of briquettes will eliminate the present unsatisfactory rolls in which the pockets are disposed in staggered relation.

The present invention embodying pockets for making rounded briquettes transversely aligned in rows is to be distinguished from the practice of having the pockets for making over-stuffed pillow type of briquettes similarly arranged. In the latter type, the walls of the pockets are all of the same contour to produce a briquette having upper and lower pyramids joined at their bases, each pyramid consisting of four equal triangular sides. Thus, the median line or line of jointure is square. In the case of the rounded briquette, however, the two similar semi-elliptic sides 15 of the pocket 11 are different in contour from the curved bottom of the pocket and the molding operations in actual practice have evidenced a distinct problem. That is to say, in molding the rounded type of briquette with the pockets staggered as has heretofore been the practice, clam shelling has frequently occurred due to over-compression, the briquettes have not been uniform in structure, and further, often disclose weakened portions due to under-compression. This is apparently due to the fact that in the case of the pockets for the rounded briquettes, the pressure increases as the point of tangency of the rolls moves toward the deepest and widest part of the respective opposed pockets and in a similar manner progressively decreases as the point of tangency moves away from the wider and deeper portions of the opposed pockets. Thus, with the briquettes in staggered relation, alternate adjacent briquettes along any line of tangency are being subjected to alternating high or low pressures at different points on the pocket areas dependent upon where the line of tangency passes across the respective pockets. Consequently, over-compression with resulting clam shelling occurs with some of the briquettes due to the fact that excess material cannot be expelled upwardly, and hence, becomes locked in the pockets, while in the case of other briquettes under-compression takes place, forming weak briquettes.

75 On the other hand, with the pockets for making rounded briquettes disposed in alignment, it is possible to make an abrasion resistant product without recourse to staggering the pockets in order to avoid dead or void space on the roll surface. Furthermore, and of particular importance, it is possible to make briquettes

which are entirely uniform in structure due to the fact, as explained above, that equal pressure is exerted on the same aligned portions of each briquette in a row at the same time in the rotative movement of the rolls. Apparently, uniform feeding takes place to each of the pockets and the pressure is able to equally relieve each pocket of excess material. Rounded type of briquettes produced in accordance with this invention are free of clam shelling and are uniformly solid and firm in structure.

Referring to Figures 4, 5 and 6, I have shown a rounded type of briquette produced in accordance with the present invention. It will be noted that the curved bottom 13a and top 13b meet along straight median lines 19 at opposite ends of the briquette, and due to the radius of curvature, the contour along this median line is curved. Further, it will be observed that the substantially elliptical sides 20 are convexly curved. Likewise, the areas along the median line 19 are both longitudinally and transversely curved. Also, the corners of the briquettes are rounded due to the configuration of the pockets, as shown, for example, at 21. There is thus formed an abrasion resistant article free of any pointed or sharp portions which would degrade under the normal conditions of handling and storage to which briquettes are subjected.

As heretofore stated, the pockets of the present invention are formed by a single cutting operation which may be of any suitable type such as machining or milling. Referring to Figures 8 and 9, I have, by way of example, illustrated a shaft 25 carrying a milling cutter 26 at one end. The milling cutter 26 has substantially the precise ratio of dimensions and contour to be imparted to the pockets 13 as shown in Figures 2 and 3 and the briquette as shown in Figures 4, 5 and 6.

The milling cutter is preferably rotated with the shaft 25 to form pockets in both rolls simultaneously, as shown in Figures 7 and 8, with the rolls having their axes parallel in the position which they will occupy during the briquetting operation. Of course, the cutting operation may be conducted upon single rolls if desired, but this is not preferred.

As many cutters may be disposed on the shaft 25 as desired or as can be accommodated, but it is preferred to use a single milling head 26 and cut pairs of pockets successively in transverse rows as shown in Figure 7 across the roll, indexing the rolls each time a new transverse line of pockets is to be formed and continuing the procedure described until the formation of pockets over the entire periphery of the rolls is completed as shown in Figures 2 and 3. As a result, the pockets are uniform in contour and dimension and have a precise mating relation with each other for molding purposes. In this cutting operation, the pockets are disposed in closely spaced relation and the area represented by the void or dead spaces is insufficient to affect the briquetting operation.

The rolls 10 are of the usual metallic construction, and the cutting member 26 is likewise of suitable metallic composition and hardness to perform the milling operation.

Referring further to Figures 7 and 8, it will be noted that the shaft 25 rotates on an axis parallel to the axes of the rolls while the rolls are being moved toward the cutter to form pockets of the above described configuration, and that the milling head is directed so as to form

the sides 15 parallel with the end walls of the rolls. As a result of the cutting operation, not only are the pockets in transverse alignment, but they are in annular or peripheral alignment as well.

I have discovered that in the manufacture of products of the general shape, i. e., as described above, it is not necessary to control or regulate plasticity of the mix within the narrow limits which are absolute requisites when the pockets are staggered. In other words, rolls having the pockets aligned transversely are affected to a much less degree by lack of plasticity. This is to be distinguished from very careful control of the mix which is necessary in connection with staggered roll pockets which appear satisfactory only when the mix has a very carefully regulated plastic condition. I believe the effect probably to be due to the plastic condition and its relation to the irregular pressure exerted on adjacent pockets when the pockets are staggered. With staggered pockets, the material under compression at the line of tangency is in more than one transverse row because the adjacent briquettes merge into this line of tangency. When plasticity is high, the excess amount can be disgorged, but, as plasticity decreases, it becomes more difficult to disgorge the excess material with staggered pockets since the several rows of briquettes are merged into the line of tangency. With the pockets in one transverse line, as herein described, every pocket has the same area under compression simultaneously and the disgorging of excess material being not so difficult, will take place with a very low degree of plasticity.

As stated above, I have found this particularly the case in the manufacture of briquettes of the shape herein described, i. e., having continuously curved top and bottom, and convexly curved sides.

I claim:

1. The method of making briquetting rolls comprising acting upon a metal roll transversely of its periphery with a cutting tool having the precise dimensions and contour of a briquette molding pocket to be formed in said roll, forming a plurality of similar shaped and sized pockets in alignment transversely across the roll, and continuing the procedure until the entire periphery of the roll has been formed with rows of transversely aligned pockets, said cutting operation constituting the only cutting step in the formation of each pocket and each pocket having as a result of such single cutting operation the final configuration which it is desired to impart to the pocket and to a briquette.

2. The method of making briquetting rolls comprising acting upon a metal roll transversely of its periphery with a cutting tool having the precise dimensions and contour of a briquette molding pocket to be formed in said roll, forming a plurality of similar shaped and sized pockets in alignment transversely across the roll, said pockets having bottoms continuously curved from end to end and convexly curved sides, and continuing the procedure until the entire periphery of the roll has been formed with rows of transversely aligned pockets, said cutting operation constituting the only cutting step in the formation of each pocket and each pocket having as a result of such single cutting operation the final configuration which it is desired to impart to the pocket and to a briquette.

3. The method of making briquetting rolls com-

prising acting upon a metal roll transversely of its periphery with a cutting tool having the precise dimensions and contour of a briquette molding pocket to be formed in said roll, forming a plurality of similar shaped and sized pockets in alignment transversely across the roll, each pocket having a bottom continuously curved from one end edge at the surface of the roll to the other and transversely and longitudinally curved sides extending outwardly and upwardly from the bottoms, the ratio of the radii of curvature of said sides to the radius of curvature of the bottom being substantially two to one, and continuing the procedure until the entire periphery of the roll has been formed with rows of transversely aligned pockets, said cutting operation constituting the only cutting step in the formation of each pocket and each pocket having as a result of such single cutting operation the final configuration which it is desired to impart to the pocket and to a briquette.

4. The method of making briquetting rolls comprising acting simultaneously upon a pair of opposed metal rolls transversely of their peripheries with a cutting tool having the precise dimensions

and contour of mating briquette molding pockets to be formed in said rolls, forming a plurality of similar shaped and sized pockets in alignment transversely across the rolls, and continuing the procedure until the entire periphery of each roll has been formed with rows of transversely aligned registering pockets, said cutting operation constituting the only cutting step in the formation of each pocket and each pocket having as a result of such single cutting operation the final configuration which it is desired to impart to the pocket and to a briquette.

5. The method of making briquetting rolls comprising acting upon a metal roll with a cutting tool having substantially the precise dimensions and contour of a briquet molding pocket to be formed in said roll and cutting a pocket having a bottom continuously curved from end to end and sides convexly curved both longitudinally and transversely upwardly and outwardly from the bottom, and forming a plurality of such pockets of similar shape and size in transverse and peripheral alignment.

GUSTAV KOMAREK. 25