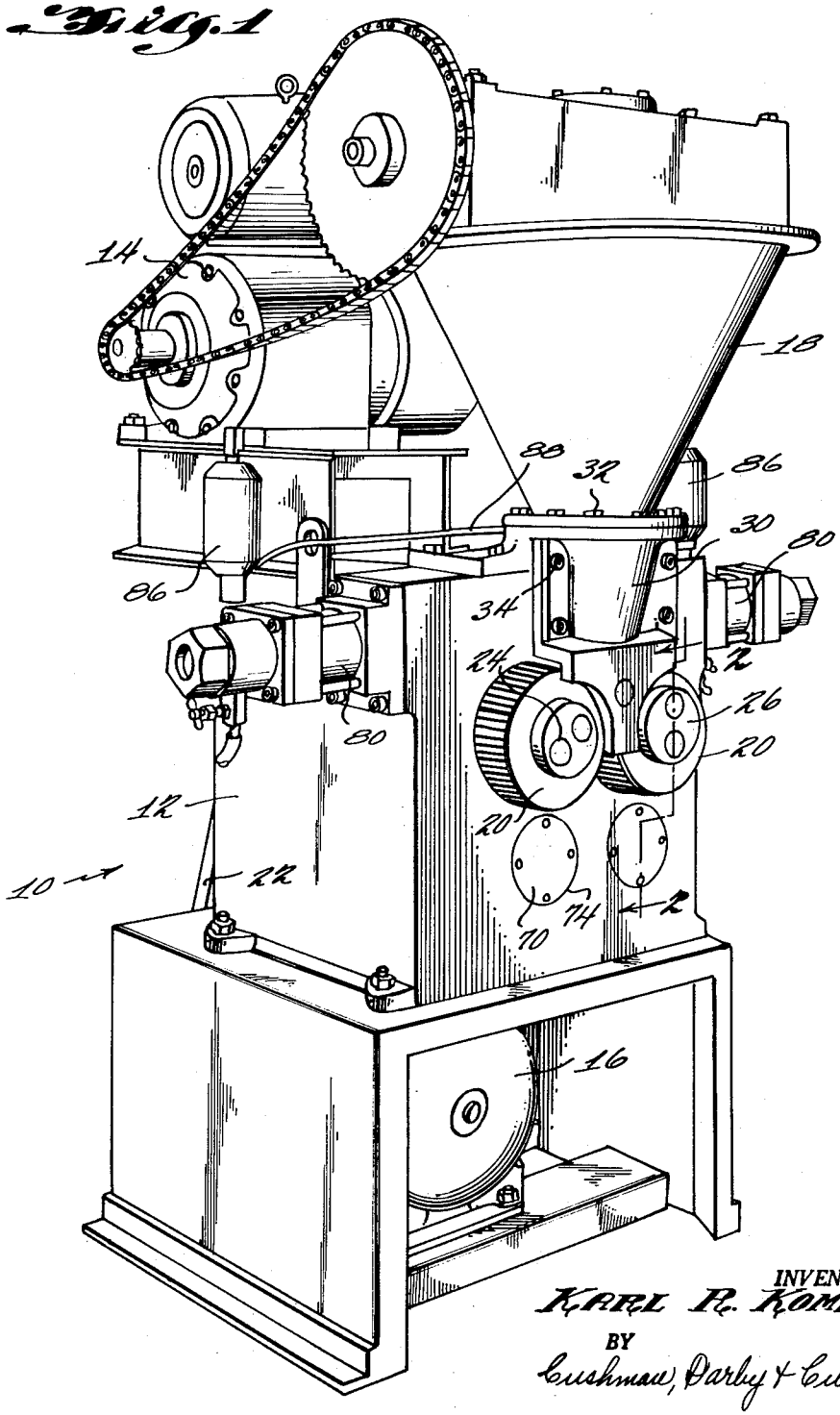
May 26, 1964 K. R. KOMAREK 3,134,156

BRIQUETTING PRESS

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Fig. 1




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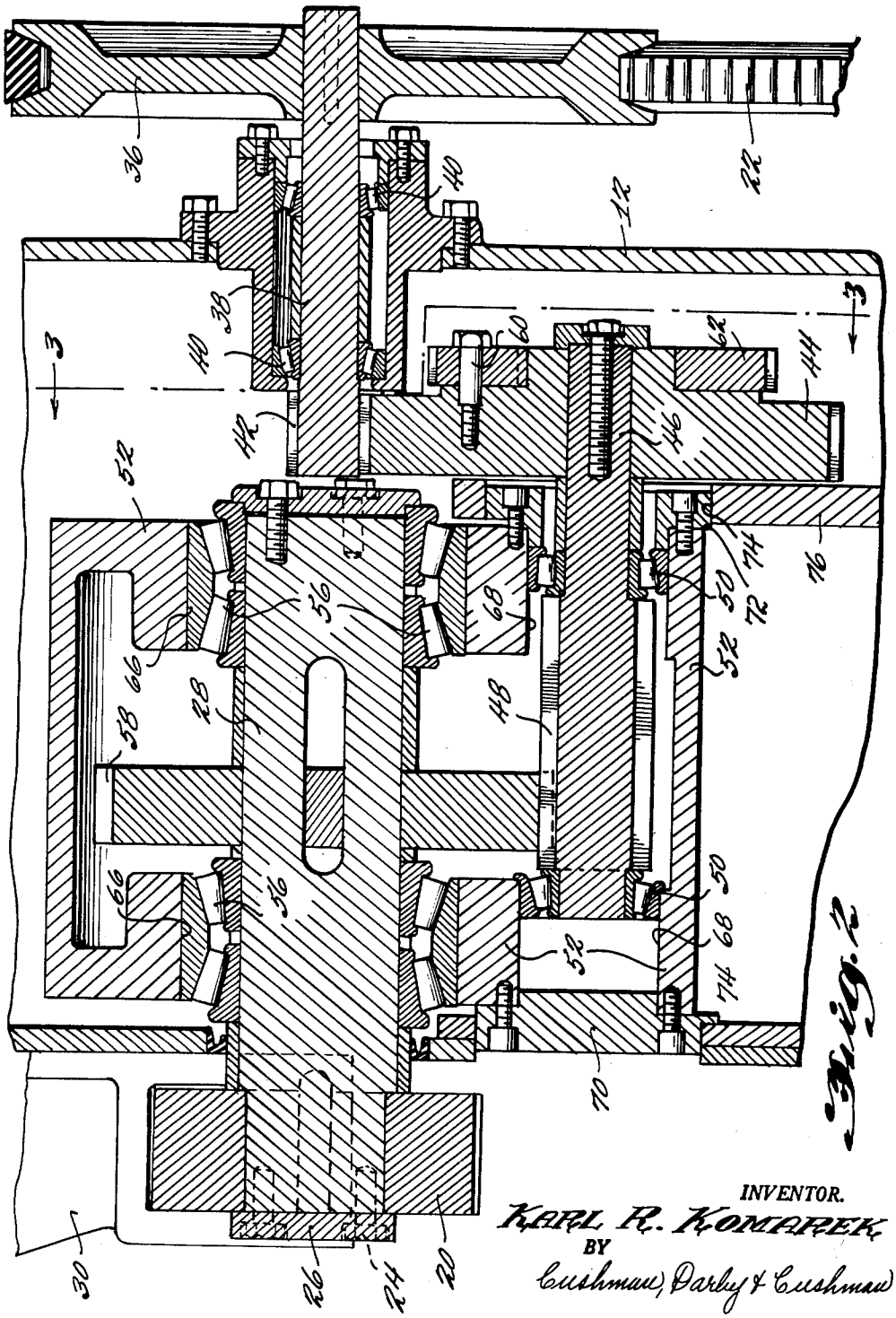



Fig. 2

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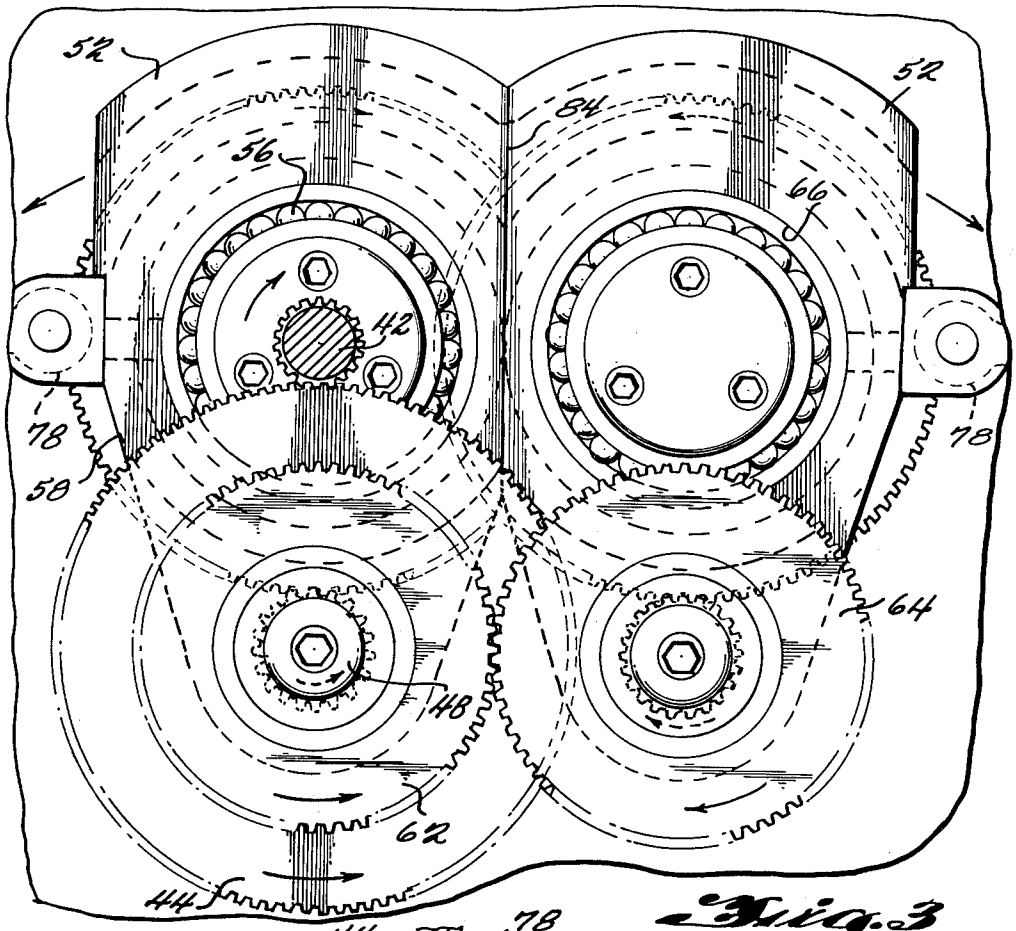



Fig. 3

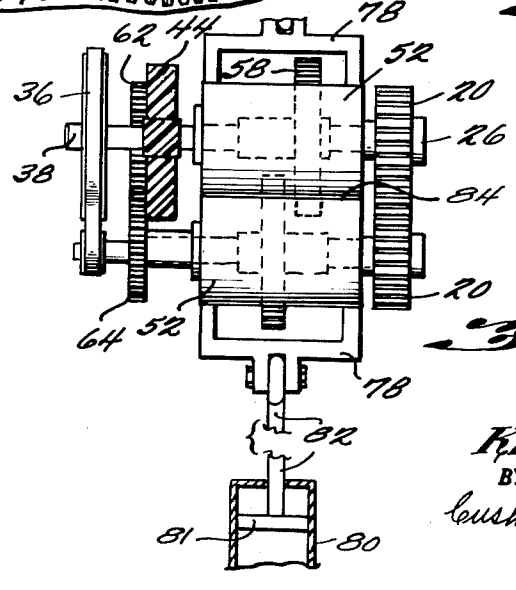



Fig. 4

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3,134,156

# BRIQUETTING PRESS

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4 Claims. (Cl. 25—77)

This invention relates generally to a laboratory briquetting press and, more particularly, to a press of improved design wherein the briquetting rolls are exposed and easily removable and further where the rolls have hydraulic yielding members which serve to bias the rolls together and which are easily and automatically adjustable for various sizes of rolls having different pocket structures formed therein.

Briquetting machines having means to bias rolls together and which will also serve to yield when an excessive amount of material has been fed to the roll pockets are old and well known in the art. These known yielding means have usually taken the form of springs as in the patent to Komarek, No. 1,164,822, issued December 21, 1915. However, such springs proved inadequate for the purposes contemplated during the development of this invention.

The briquetting machine, which is presently to be described, has been designed for use primarily in the laboratory. Such use presents problems which are not posed by machines employed for production purposes. In the laboratory new rolls employing various pocket structures and patterns are tested in order to determine the most practicable form and shape of pockets for eventual production use. Therefore, it is very helpful and almost mandatory that the briquetting rolls be easily accessible, and further, that the yielding means biasing the rolls together be of such a type as to be easily and readily adjustable to accommodate various sizes of rolls and also to be adjustable as to various pressures to be applied thereto.

Since the machine structure herein contemplated is to be used in a laboratory it is indeed desirable that the machine be of limited size. Springs for applying the forces necessary in such an application are of necessity large and cumbersome thereby unduly increasing the size of the machine. Furthermore, they are not easily adjustable for the accommodation of various roll sizes. Then too, springs under compression do not maintain a constant or substantially constant force on the rolls as they are compressed, but rather the force of the springs acting upon the rolls increases as the springs are compressed. This latter effect is especially undesirable.

The present invention is an attempt to overcome the deficiencies of prior briquetting machines as has been noted. In place of these springs, a hydraulic piston and cylinder arrangement has been employed for the purposes of biasing the briquetting rolls into engaging relationship. These resilient members are adapted to yield when and if an unusual amount of material has been fed into the compressing roll pockets. The pressure of the hydraulic unit acting upon the rolls can be easily varied, but when a certain pressure has been decided upon for a particular operation, this pressure will be maintained without variance if the rolls should be forced apart by the material being compressed in the faces thereof. Furthermore, the cylinder and piston arrangement can be further adjusted to accommodate various sizes of rolls which it may be desirable to test from time to time.

Accordingly, it is an object of this invention to provide a new and improved briquetting press employing a piston and cylinder arrangement for biasing the rolls thereof into mating engagement.

Another object of this invention is the provision of a laboratory type briquetting press which is of compact design and in which the rolls are exposed in order to facilitate easy removal and replacement thereof.



Yet another object of this invention is the provision of a laboratory type briquetting press having a pair of rolls whose drive axes pivot about a second set of axes spaced therefrom.

Other and further objects of this invention will become more apparent from the following description taken in conjunction with the drawings in which like reference numerals refer to like parts throughout.

Referring to the drawings:

FIGURE 1 is a perspective view of a preferred laboratory type briquetting machine forming the basis of the present invention;

FIGURE 2 is a view in section taken substantially along lines 2—2 of FIGURE 1 and showing more clearly the drive arrangement for one of the briquetting rolls;

FIGURE 3 is an end view partly in section taken substantially along lines 3—3 of FIGURE 2; and

FIGURE 4 is a top view of the drive structure for the cooperating rolls.

With more particular reference to the drawings, the laboratory type briquetting press is generally indicated at 10 in FIGURE 1. This press comprises a housing 12 substantially enclosing the drive apparatus for the briquetting machine. Mounted on the housing structure are a pair of electrical motors 14 and 16, the motor 14 being adapted to drive the conventional mechanism located within the conical feeder 18.

The electrical motor 16 serves to drive the cooperating briquetting rolls 20 by means of a drive belt 22, although it is to be understood that various other means such as gears might also be employed. It is to be noted that the briquetting rolls 20 are located on the exterior of the housing 12 and are easily removable upon removal of the bolts 24 securing them through the face plate 26 into the drive shaft 28. This is most clearly shown in FIGURES 1 and 2. The member 30 which serves as the base of the feeder and as a guide housing around the briquetting rolls must also be removed by means of the bolts 32 and 34 from the lowermost portion of the feeder 18 and the housing 12. Therefore, if desired, upon removal of the member 30 and the face plates 26, the rolls 20 may be quickly and easily removed and replaced with a new set of rolls for subsequent testing. It is understood that a different shape of feeder base 30 might be employed with each different size of rolls which are employed for testing purposes.

With particular reference to FIGURES 2 and 3, the drive mechanism employed in the briquetting press will now be described. Since the briquetting machine of the invention employs two identical drive mechanisms, one for each roll, a description of one of these will suffice for purposes of explanation. As was mentioned previously, the electrical motor 16 is adapted to drive the belt 22 which partially encircles the pulley 36 for driving same. A stub shaft 38 is suitably keyed to the pulley 36 and is supported for rotation within the housing 12 by means of the bearings 40. A pinion gear 42 is formed at the end of stub shaft 38 opposite the pulley 36 and meshes with a gear 44. The gear 44 is suitably keyed or splined to a second stub shaft 46 which has a pinion 48 formed thereon. The stub shaft 46 is rotatably mounted as by bearings 50 within suitable openings 68 formed in the pivot arm 52 which will be described subsequently.

The drive shaft 28 to which is secured one of the rolls 20 is also supported for rotation as by bearings 56 within suitable openings 65 formed in the pivot arm 52. Fixed upon the drive shaft 28 by splines or other suitable means

is a gear 58 which is positioned for meshing engagement with pinion 48.

Fastened to the gear 44 as by bolts 60 is a gear 62. As is most easily seen in FIGURES 3 and 4 the gear 62 meshes with a similar gear 64 which through a gear and shaft arrangement identical to that shown in FIGURE 2 drives the mating briquetting roll to that shown in FIGURE 2. The gears 62 and 64, being of the same diameter, drive the rolls 20 in opposite directions but at the same rotational speed thereby maintaining the alignment of the roll pockets at all times.

The pivot arms 52, which have been referred to previously, will now be more fully described. Each roll driving assembly is equipped with a pivot arm 52, each pivot arm assuming a shape substantially as shown in FIGURES 2, 3, and 4. Each pivot arm 52 has a circular opening as at 66 passing therethrough which receives the bearings 56 rotatably mounting the drive shaft 28. A second circular opening indicated at 68 also passes through each pivot arm below the opening 66 and substantially parallel thereto. The opening 68 receives therein the bearings 50 rotatably mounting the stub shaft 46 therein. A substantially circular pivot arm cap 70 (see FIGURE 2) is bolted to one end of the pivot arm closing off the circular opening 68 at one end thereof.

A second pivot arm cap 72 of annular shape is also bolted to the pivot arm at the end of the opening 68 opposite pivot arm cap 70. The caps 70 and 72 are received for rotation in circular openings 74 located in suitable support structure 76. Thus, each pivot arm is adapted to pivot on the caps 70 and 72 about an axis parallel to the drive shaft 28 and spaced therefrom, and it can be readily seen that each pivot arm 52 pivots about an axis which coincides with the axis of the stub shaft 46.

As is most clearly seen in FIGURES 3 and 4, a pair of yokes 78 engage the sides of the pivot arms 52. These yokes are connected to pistons 81 conventionally mounted within a pair of cylinders 80 by means of connecting rods 82. The cylinders 80 may be of any conventional hydraulic type which is controlled from a point remote from the briquetting machine 10, although, of course, it is to be understood that they may be of the pneumatic type if such a construction would be desirable. The elements indicated at 86 are hydraulic accumulators containing a charge of nitrogen gas to act as a cushion for the hydraulic cylinder. The conduit 88 is a pressure equalizer line connecting each of the hydraulic cylinders in a conventional manner.

In operation, the motor 14 is employed to drive the feeding mechanism located within the hopper 18. The electrical motor 16 is operated to drive the rolls 20 by means of belt 22, pulley 36, pinion 42, and gear 44. The gear 44 rotates the gear 58 through pinion 48, and therefore also roll 20 fixed to drive shaft 28 on which gear 58 is keyed. Gear 62 which is secured to gear 44 engages its twin gear 64 (see FIGURE 4) which serves to drive a second briquet roll identical to the first by means of mechanism identical to that shown in FIGURE 2, with the exception of gear 44.

Pressure is applied to each cylinder urging the pivot arms 52 into engagement along their common surfaces indicated at 84. The pressures involved within the cylinders are variable at the will of the operator, and in this manner, various pressures may be applied to the faces of the briquetting rolls 20. If an excessive amount of material should happen to be inserted between the roll faces from the hopper 18, the pistons within the cylinders 80 will yield when the forces involved exceed a predetermined amount. Also, the pistons may be retracted and therefore also the yokes 78 thereby allowing the pivot arms 52 to pivot about the arm caps 70 and 72 so that their common surfaces 84 are disengaged. In this manner, the rolls 20 indicated in FIGURE 1 may be replaced with a pair of rolls of a diameter different from the first set by merely removing the base of the conical feeder 18 and the face plates 26. When the larger rolls are employed, the cylinders 80 will once again be pressurized to any desired amount of pressure to urge the faces thereof together. When an excessive amount of material is fed between the rolls, and the roll faces are forced out of engagement, the force of the cylinders acting on the rolls remains constant at the predetermined value regardless of how far apart the rolls are caused to separate. Of course, it is understood that the operator could manually alter the amount of pressure being applied to the rolls if that should be desirable.

Even as the roll faces are caused to separate against the force exerted on them by the cylinders, since the arms 52 pivot about an axis which coincides with each stub shaft 46, the gears 62 and 64 remain enmeshed at all times thereby maintaining the alignment of the pockets formed in the mating rolls 20.

Thus, an improved briquetting machine of the laboratory type has been disclosed which is of compact design and in which the rolls are easily accessible, removable, and replaceable. A further feature is the provision of hydraulic yielding members which are positioned to bias the rolls together but which will separate when an excessive amount of material has been fed into the roll pockets. These yielding members are of such a type as will maintain a constant force on the rolls at all times and are easily and quickly adjustable to accommodate various sizes of briquetting rolls.

While the form of the briquetting roll press described herein constitutes a preferred embodiment of the invention, it is to be understood that this invention is not limited to this precise form of apparatus, but that various changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a briquetting press wherein a particulate material is fed into cooperating briquette forming cavities formed in the peripheries of rotating briquette forming rolls the combination comprising: a housing, a first and second shaft-carrying means pivotally mounted on said housing so as to pivot about first and second pivot axes respectively, a first shaft rotatably carried by said first shaft-carrying means so that said first shaft has a free unsupported end extending externally of said housing, a second shaft rotatably carried by said second shaft-carrying means so that said second shaft has a free unsupported end extending externally of said housing and laterally disposed from the free end of said first shaft, a pair of rolls having cooperating briquette forming cavities formed in their peripheries, the first roll of the pair being operatively mounted on the free end of said first shaft and the second roll of the pair being operatively mounted on the free end of said second shaft so that said rolls are operatively positioned externally of said housing and said first and second shafts are movable toward and away from one another by pivotal movement of said first and second shaft-carrying means about their respective pivot axes whereby said rolls are readily accessible and removable from their mountings and said press can readily accommodate various size rolls.

2. A briquetting press comprising in combination a housing, a first shaft-carrying means pivotally mounted on said housing so as to pivot about a first pivot axis, a second shaft-carrying means pivotally mounted on said housing so as to pivot about a second pivot axis, a first shaft rotatably carried by said first shaft-carrying means so that said first shaft has a free end extending externally of said housing, a second shaft rotatably carried by said second shaft-carrying means so that said second shaft has a free end extending externally of said housing, a pair of rolls having cooperating briquette forming cavities formed

in their peripheries, the first roll of the pair being operatively mounted on the free end of said first shaft and the second roll of the pair being operatively mounted on the free end of said second shaft so that said rolls are operatively positioned externally of said housing and are readily accessible, means feeding material to said cavities, resilient means operatively associated with said first and second shaft-carrying means normally urging said first and second shaft-carrying means to pivot about their respective pivot axes toward one another and thereby urge said rolls into operative associated, said resilient means being adapted to yield and thereby allow said rolls to separate when the pressure thereon exceeds a predetermined value and means rotating said first and second shafts in opposite directions at the same rotational speed whereby the operative alignment of said cooperating briquette forming cavities is maintained during the movement of said rolls toward and away from one another.

3. The briquetting press set forth in claim 2 wherein said resilient means comprises a pair of pressurized hydraulic cylinders having pistons therein connected to said pivotal supporting means for pivoting same whereby a constant force is applied to said rolls regardless of the respective positions of the rolls.

4. The briquetting press set forth in claim 2 wherein said means rotating said first and second shafts includes



third and fourth shafts in operative driving engagement with said first and second shafts respectively, said third shaft being rotatably carried by said first shaft-carrying means and rotating about an axis which coincides with said first pivot axis, said fourth shaft being rotatably carried by said second shaft-carrying means and rotating about an axis which coincides with said second pivot axis, said third shaft being in operative driving engagement with said fourth shaft and power means operatively connected to said third shaft to operatively rotate said third shaft.

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