Feb. 10, 1970 R. WARNKING 3,494,281

FORMING FIBROUS MATERIAL INTO A CYLINDRICAL BODY

Filed Jan. 12, 1968

FIG. 1.

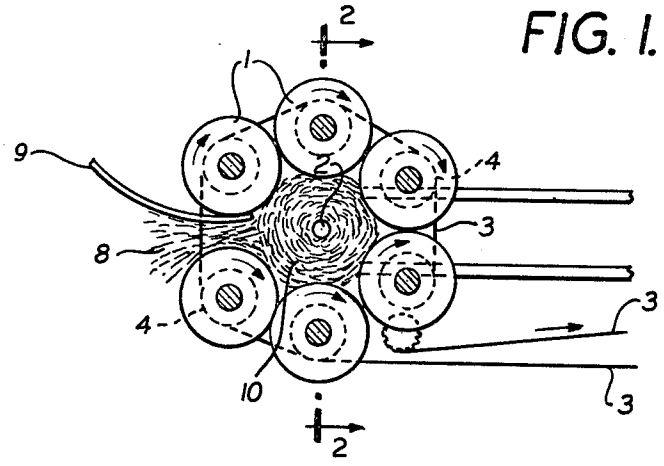
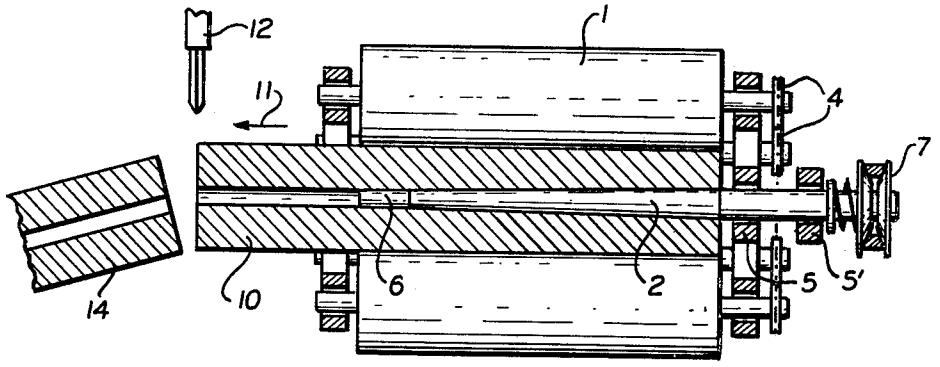


FIG. 2.



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FORMING FIBROUS MATERIAL INTO A CYLINDRICAL BODY

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Int. Cl. B30b 3/04
U.S. Cl. 100—86 3 Claims

ABSTRACT OF THE DISCLOSURE

Fibrous material, for example fibrous fodder, is formed into a cylindrical body which can be cut to provide briquettes. The fibrous material is fed into the smaller end of a tapered annular space defined by a centrally disposed mandrel and confining means provided, for example, by a plurality of rollers disposed as planets about the mandrel. The mandrel is continuously rotated relative to the confining means to twist the fibers into the desired form and the compactness and permanency of the new form is controlled by varying the speed of rotation with an infinitely variable drive means.

The present invention relates to a machine for the briquetting of, for example, fodder plants, and particularly stalk material, which may consist of a plurality of cylindrical or conical pressing rollers, the center axes of which are arranged at least approximately on the surface of an imaginary round body a conical or cylindrical pressing mandrel which rotates during operation being located within said imaginary body between the pressing rollers in order to twist the material to be compressed into the form of a firm briquette. The essence of the invention resides in the fact that it provides a simple way of controlling the speed of advance of the briquette emerging from the pressing rollers and thus the degree of twisting of the briquette.

In accordance with U.S. Patent 3,191,366, there is known a machine in which the compressed strand is firmly twisted on a pressing mandrel which rotates together with it. By a special device, the strand is pushed at given time intervals off from the pressing mandrel and is then cut into smaller briquettes by a cutting device. Aside from the fact that very large frictional forces must be overcome for this pushing off of the strand which takes place at regular intervals, there are produced briquettes of constantly different thickness or of a different degree of twisting since the feeding of the material to the pressing rollers can never be effected entirely uniformly. In particular briquettes which are not sufficiently twisted together will open up and interfere with the further flow in the machine and are lost for all practical purposes for the harvesting.

In order to eliminate these disadvantages, the present invention provides that the speed of rotation of the pressing mandrel with respect to the pressing rollers be adjustable by means which are in themselves already known. By this measure, it is made possible to turn the pressing mandrel relative to the rotating strand.

As a result of the taper of the mandrel or of the pressing rollers, there is exerted on the strand an axial force which counteracts the static frictional force which is produced by the rubbing between the strand and the pressing mandrel or between the strand and the pressing rolls. By the relative movement of the pressing mandrel with respect to the strand or of the pressing rollers with respect to the strand the high force of static friction is converted into a much smaller sliding friction so that the strand

leaves the pressing rollers substantially more easily due to the axial force acting on it. By the measure in accordance with the invention the speed of the strand coming from the pressing rolls and thus also the firmness of the rolling of the strand can be controlled.

In order to be able both to adapt the machine to the different types and conditions of material and to be able precisely to obtain the desired strength of the briquettes, it is furthermore provided that the speed of rotation of the pressing mandrel wtih respect to the pressing rollers be made infinitely variable.

Thus, the invention provides apparatus for forming fibrous material into a cylindrical body. The apparatus includes an elongated mandrel, and confining means for confining the fibrous material about the mandrel. The confining means defines an elongated, annular, tapered space about the mandrel so that the annular space has an end of relatively large cross-sectional area, and an end of relatively small cross-sectional area. Means are provided for feeding the fibrous material to the end of the annular space of relatively small cross-sectional area. Further, means are provided for rotating the mandrel relative to the confining means and for varying the rate of the rotation. In a preferred embodiment, the confining means comprises a plurality of rotatably mounted rollers disposed as planets about the mandrel. To provide provision for feeding of material to the annular space, two next adjacent rollers can be spaced at the ends thereof adjacent the small end of the annular space. Thus a feed inlet opening to said annular space is provided. The means for providing relative rotation can include means for rotating the rollers and also means for rotating the mandrel.

The invention is explained in further detail with reference to the accompanying drawings:

In the drawings:

FIGURE 1 shows a schematic arrangement of a machine in accordance with the invention seen in end elevation; and

FIGURE 2 shows the machine of FIGURE 1 in a section along the line 2—2 in FIG. 1.

The machine consists essentially of six pressing rollers **1** as well as the pressing mandrel **2** located within the pressing rollers **1**. The pressing rollers **1** are cylindrical and are placed jointly in rotation via the chain **3** and the sprocket wheels **4**. The pressing mandrel **2** which is supported in overhung fashion in the bearings **5**, **5'** is of conical shape and has a cylindrical extension **6**. The drive is effected via an infinitely variable PIV gearing **7**.

The stalk material **8** is fed laterally along a slide plate **9** to the pressing rolls **1** and twisted by the latter around the pressing mandrel **2** to form a firm strand **10** which leaves the machine laterally in the direction indicated by the arrow **11**. The rolls **1** and the mandrel **2** have a smooth surface. By the possibility of adjusting the speed of rotation of the pressing mandrel **2** relative to the pressing rolls **1**, the speed of the strand **10** coming from the pressing rolls **1** and thus the firmness of the twist can be adjusted. The speed of revolution of the pressing mandrel **2** could also be controlled in other ways in accordance with the invention.

Any suitable cutting means can be used to cut the cylindrical strand **10** issuing from the machine to provide briquettes of the desired length.

As the cylindrical body **10** issues from the machine, a reciprocating cutter **12** cuts the cylindrical body up to provide briquettes **14**.

1. Apparatus for forming fibrous material into a cylindrical body comprising:

(a) an elongated mandrel;

(b) confining means for confining the fibrous material about the mandrel, said confining means defining an

elongated, annular, tapered space about the mandrel so that said annular space has an end of relatively large cross-sectional area;

(c) means for feeding the fibrous material to the end of the annular space of relatively small cross-sectional area;

(d) means for rotating the mandrel relative to said confining means; and

(e) means for infinitely varying the rate of said relative rotation operatively mounted in the apparatus.

2. Apparatus according to claim 1, wherein the confining means comprises a plurality of rotatably mounted rollers disposed as planets about the mandrel.

3. Apparatus according to claim 2, wherein said means for rotating includes means for rotating the rollers and means for rotating the mandrel.

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U.S. Cl. X.R.

56—1; 100—89; 107—14

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,494,281 Dated Feb. 10, 1970

Inventor(s) Richard Warnking

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

1. Col. 3, line 3, after "cross-sectional area" insert --and an end of relatively small cross-sectional area--.

2. Col. 2, between lines 67 and 68, insert "What is claimed is"

SIGNED AND
SEALED
JUL 14 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents