

[54] **CARBON BLACK PELLETIZER**

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[58] Field of Search .... 425/222, 332, 402; 264/310,  
264/128, 109; 241/191

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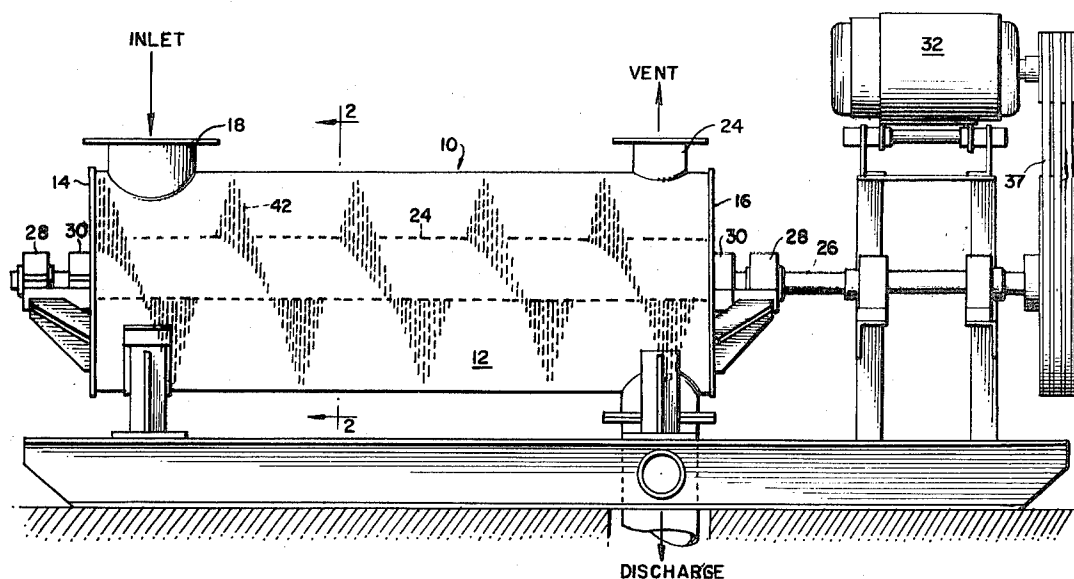
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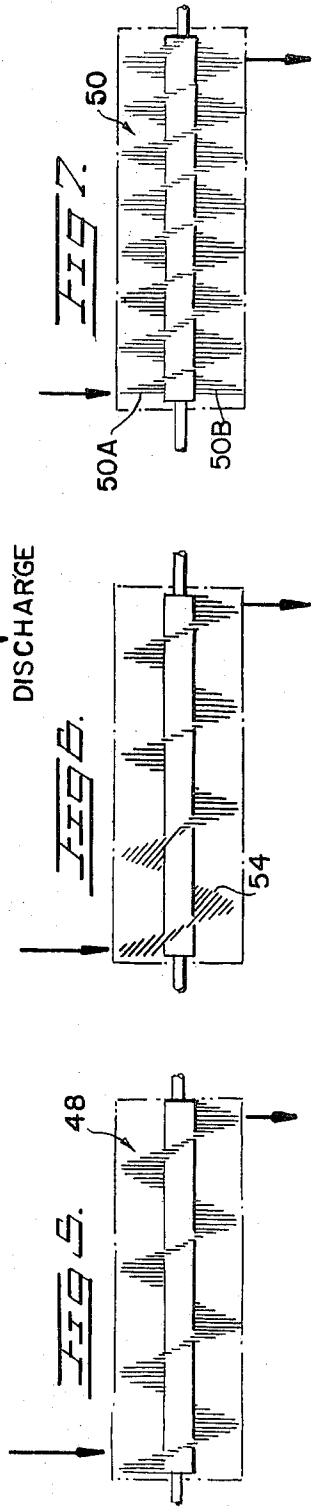
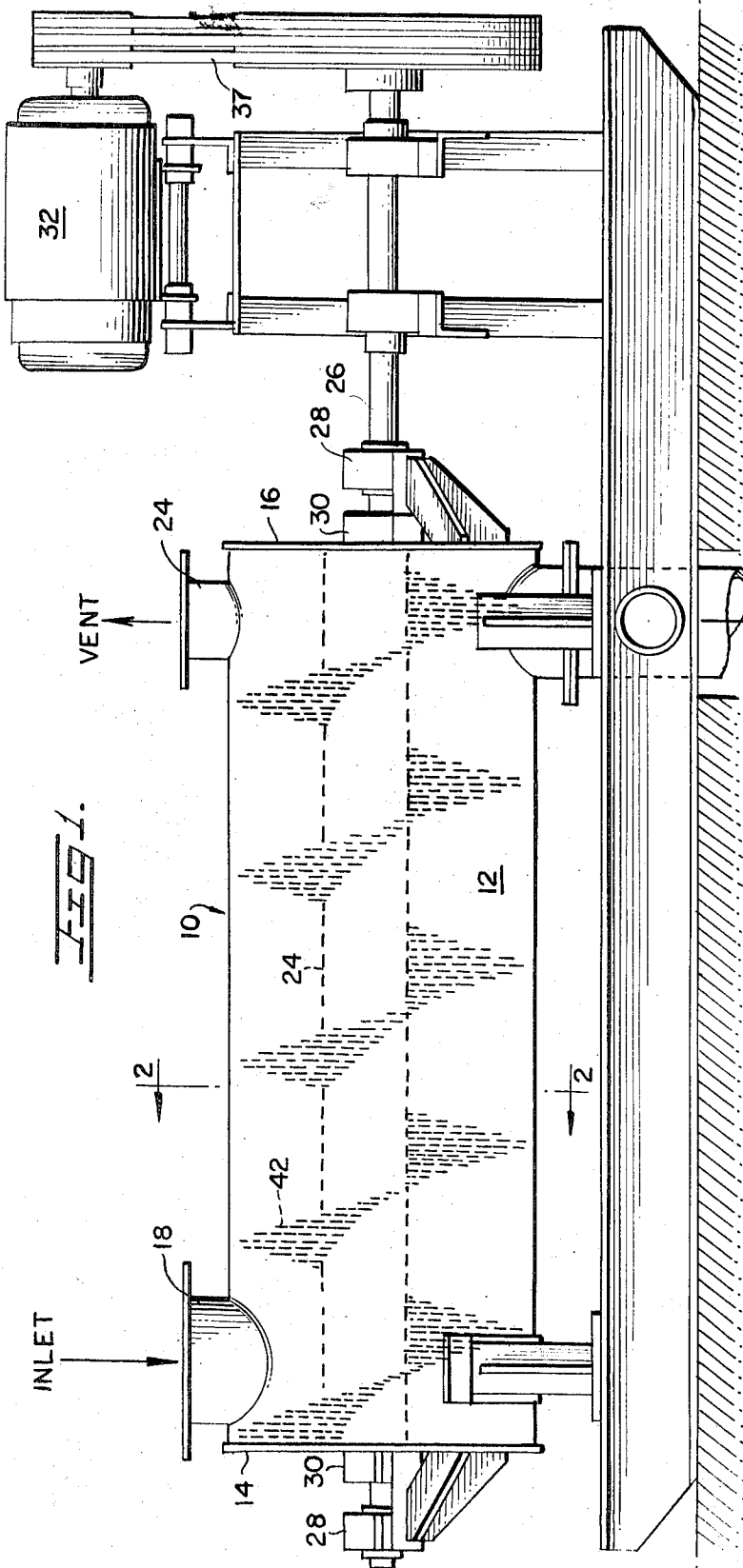
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**ABSTRACT**

A carbon black, and the like, pelletizer having a rotor with a multiplicity of flat, bladelike toolholders attached to a rotatable shaft and each mounting at the end thereof a pelletizing tool in the nature of a pin. The toolholders are so designed and arranged as to effectively form a helix, in conjunction with the pins, for advancing the material during pelletizing to an outlet, and one embodiment provides a double helix for substantially working all of a product at all times.

**7 Claims, 7 Drawing Figures**





SHEET 2 OF 2  
ROTATION

FIG 2.

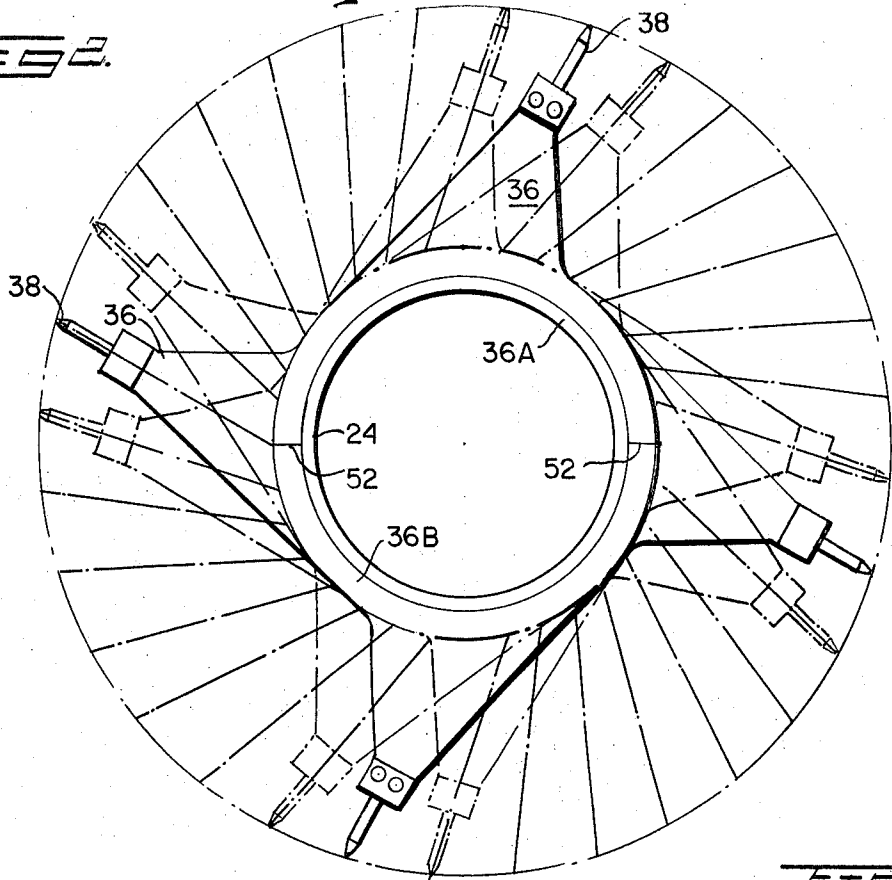


FIG 3.

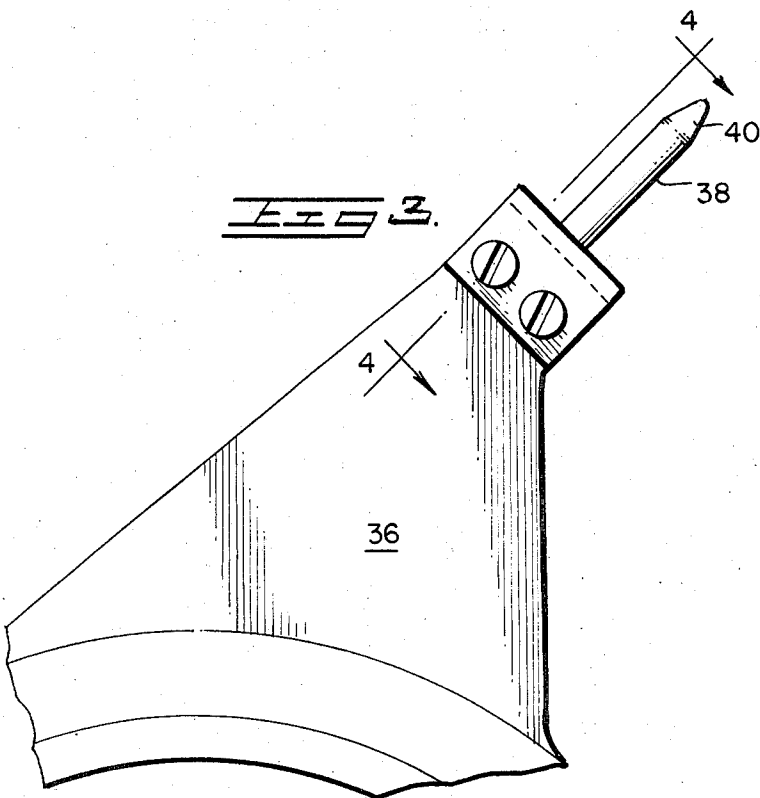
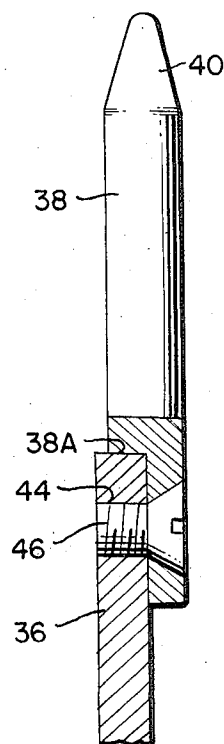


FIG 4.



## CARBON BLACK PELLETIZER

## BACKGROUND OF THE INVENTION

Carbon black pelletizers are traditionally called "pin-mixers" due to the metal rods or pins which, when fixed to a rotating shaft, intermix the carbon black and pelletizing solution and "work" the product into spherical agglomerates. The cylindrical rods have been welded to shafts, inserted into threaded or socket weld "pin-holders" hard surfaced and canted at an angle with the plane of rotation in efforts to eliminate over stressing and improve pin life. Heretofore, however, no shapes other than cylindrical have been considered or used due to economic reasons.

It is an object of the present invention to provide a pelletizing machine departing from prior designs and which constitutes a substantial improvement in the art of such apparatus.

## SUMMARY OF THE INVENTION

The present invention teaches a new approach and concept in pelletizing machines adapted for carbon black and other materials having improved structural and operational characteristics. The apparatus includes a rotor having a plurality of flat toolholders in the nature of relatively thin blades attached to a hollow shaft and which are so spaced and arranged that there is no interference in assembly and the end of each blade is machined to fit a pelletizing tool in the nature of a cylindrical pin. The blades are angularly displaced with respect to one another progressively along the shaft and effectively, in conjunction with the pins, form a helix for advancing the material during pelletizing from an inlet to an outlet. The flat toolholders provide a much stronger and more rigid design at equal or less cost than previously known structures and the apparatus is more compatible with the process of high speed, high horsepower solids/liquids mixing. In one form of the invention a double helix is provided to insure that all of the product is being worked at all times. A further aspect of the invention includes the concept of providing the blades with a pitch to impart a more pronounced conveying action in the inlet area of the material being worked and where the apparatus is most likely to become plugged.

Additional objects and advantages of the invention will be more readily apparent from the following detailed description of embodiments thereof when taken together with the accompanying drawings in which:

FIG. 1 is a side elevational view of a pelletizing machine in accordance with the invention and associated drive mechanism;

FIG. 2 is an enlarged detailed vertical sectional view taken on line 2—2 of FIG. 1, showing the auger or helix type pelletizing rotor including the offset arrangement of the toolholders and pelletizing tools mounted thereon;

FIG. 3 is an enlarged, detailed fragmentary elevational view of a single pelletizing tool as shown in FIG. 2;

FIG. 4 is an enlarged, detailed fragmentary sectional view taken along line 4—4 of FIG. 3;

FIG. 5 is a schematic elevational view disclosing the augured configuration derived by employment of a multiplicity of pelletizing tools as shown in the preceding figures;

FIG. 6 discloses a modified arrangement of pelletizing tools wherein the blades are twisted or pitched proximate the inlet opening to impart greater acceleration to material in the entrance zone; and

FIG. 7 shows a still further modified form wherein a double helix arrangement is provided to permit overlapping of the pelletizer tools.

Referring now to the drawings in greater detail, there is shown in FIG. 1, a pelletizer machine generally designated 10 which includes a cylindrical shaped housing 12 closed at the opposite longitudinal ends 14 and 16. An inlet is provided at 18 for introduction of material to be pelletized in a usual manner and a discharge outlet 20 is provided at the opposite end. A vent opening is provided at 24 in the top of the housing.

A hollow shaft 24 is rotatably journaled within housing 12 with the ends thereof mounted to a drive shaft 26 through appropriate stub shafts or axles or the like operatively mounted in bearings or pillow blocks 28 at opposite ends externally of the housing. Shaft seals 30 are provided for appropriate sealing. Drive means include, as shown, an electric drive motor 32 operatively drivingly connected to shaft 26 by a belt and pulley arrangement generally indicated at 34.

The pelletizing tool, shown in greater detail in FIGS. 2, 3 and 4 includes a plurality or multiplicity of flat, relatively thin blades 36 welded along and to the exterior of hollow shaft 24. The attachment can vary as will appear hereinafter. To the end of each blade 36 a pelletizing tool 38 is appropriately attached. The blades and pelletizing tools which are in the nature of cylindrical pins having tapered ends as at 40 conjointly in their spaced and angularly offset disposition longitudinally of the shaft constitute the pelletizing tool generally indicated at 42 which, as shown, is in the nature of an auger or helix to impel the material being pelletized from the inlet to the discharge of the apparatus while effecting pelletizing of the material.

The rotor with the flat toolholders as shown provides a much stronger and more rigid design at equal or less cost than previous constructions and is more compatible with high speed, high horsepower solids/liquids mixing processes. In a preferred construction, a series of relatively thin blades 36 are welded to the shaft 24 and can include, for example, 258 for a 100 inch long pelletizer. The blades are  $\frac{3}{8}$  inch thick and spaced at  $\frac{3}{4}$  inch intervals but on  $11\frac{1}{4}^\circ$  courses so that there is no interference and fillet welding is fairly easy after fitup. Preferably, as shown in FIGS. 3 and 4, tapped holes 44 are provided and the end of each blade is machined to fit and attach a pelletizing tool 38 by means of screws or bolts such as at 46. The tool 38 can be either machined from a T-shaped section of flame-cut metal, usually 316 stainless steel, or from a mass produced forging with the diameter already formed, using the aforementioned dimensions the diameter would be one-half inch. The attachment can be by welding, bolting or a combination and, as shown in these figs. to one side of a blade. These figs. also show the trailing or canted angle with respect to the plane of rotation in order to eliminate over stressing and improve pin life. A recess 38A permits close plate spacing.

The arrangement of the blades and pins is such as to in effect constitute an auger or helix as shown generally indicated at 48 in FIG. 5 depicting the spiral arrangement. The pin can be attached to one side of the first blade of a double helix. By attaching the tool to the op-

posite side of the first blade of a second helix and continuing throughout the length of the shaft, a configuring arrangement occurs where all tools overlap by one-eighth inch, thus insuring that all of the product is being worked at all times. Such a double helix arrangement is generally indicated at 50 in FIG. 7 with the first helix indicated at 50A and the second helix at 50B. This latter design has applications other than carbon black and, in fact, provides continuous, in-line efficient solids/liquids mixing for different materials and useful in different industries.

It is possible to make the blades in two halves for ease of manufacture and assembly. Such a construction is generally shown in FIG. 2 wherein a first half is generally shown at 36A and a second half at 36B which include hub or base portions for attachment to the hollow shaft, the division line between the halves being indicated at 52. In this embodiment it will be appreciated that two pelletizing tools are used per holder.

An arrangement is shown in FIG. 6 wherein a more pronounced conveying action is provided in the inlet area which is the zone most likely to become plugged. This is accomplished by the blades being pitched as indicated at 54. As carbon black is quite light in its fluffy form (2-4 pounds/cubic foot) the blades, particularly when pitched as in the inlet area will act as an axial fan and increase the blending efficiency, thereby requiring less water or solvent per pound of product. As all moisture must eventually be driven off, this represents a substantial savings in costs.

As has been pointed out, the present construction provides substantially greater strength than does an overall pin construction as referred to in the prior art and a blade construction is also more stable from a vibrational standpoint. The design and arrangement, as pointed out hereinbefore, results in a much more efficient pelletizing of the material.

Manifestly, minor changes in details of construction can be effected without departing from the spirit and scope of the invention as defined in and limited solely by the appended claims.

We claim:

1. A pelletizer machine comprising:

A. a cylindrical housing having a material inlet, and material outlet;

B. a pelletizer rotor operatively rotatably mounted in said housing, said pelletizer rotor including:

i. a shaft;

- ii. a plurality of flat planar blades of thin thickness radially attached to and spaced longitudinally along said shaft;
- iii. said blades being respectively attached to said shaft at a reversely inclined angle from the perpendicular in the direction of rotation of said shaft, and angularly offset with respect to one another as subsequently positioned along the length of said shaft;
- iv. cylindrical, tapered end pelletizing pins attached to and radially extending from the ends of said blades and disposed at the same reversely inclined angle therewith; and
- v. said blades and said pelletizing tools being so angularly disposed and spaced as to operationally constitute a helix for working and impelling material in and through said housing.

2. A pelletizer machine as claimed in claim 1, wherein said blades and pins are attached to and so positioned on said shaft as to constitute a double helix and wherein all said pins dimensionally overlap with respect to adjacent ones thereof to facilitate working of all the product at all times.

3. A pelletizer machine as claimed in claim 2, wherein a pelletizing tool is attached to one side of the first blade of the double helix and a pelletizing tool is attached to the opposite side of the first blade of the second helix with the arrangement continuing throughout the length of the shaft and the angular disposition being such that a continuous, in-line efficient solids/liquids mixing is effected.

4. A pelletizer machine as claimed in claim 1, said blades having hub portions welded to said shaft.

5. A pelletizer machine as claimed in claim 4, wherein said blades are composed of two halves, each including a blade portion and a hub portion, said hub portions being welded to said shaft and oppositely disposed with respect to one another.

6. A pelletizer machine as claimed in claim 1, said pin having a recess at the base end thereof engageable with a blade end for overlapping attachment thereto.

7. A pelletizer machine as claimed in claim 1, wherein said blades in the inlet area of said housing are angularly pitched from a vertical plane through said shaft to provide increased conveying and blending action.

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