My invention relates to pellet mills and more particularly to a die for such mills.

Pellet mills are employed in the extrusion of pelleting material through dies, from which pellets are formed by severing the extruded material as it emerges from the extrusion end of the die. The dies are fixed as to cross sectional size and shape of pellet and thus are limited as to the type of product produced.

Further, in the extrusion of pellet material involving sawdust, great difficulty has been experienced in forcing such material through the holes of a conventional die, invariably resulting in such holes being choked to the point of blocking extrusion therethrough. Thus conventional dies could not be employed from a practical viewpoint, in the pelleting of material of this character.

This latter difficulty is believed attributable to the excessive heat developed during extrusion, sufficient at times to carbonize some of the material, and the resulting expansion of the material to a degree which caused it to bind in the die holes.

Among the objects of my invention are:
1. To provide a novel and improved pellet mill die;
2. To provide a novel and improved pellet mill die which enables formation of pellets with greater ease and economy;
3. To provide a novel and improved pellet mill die for use in extruding material such as sawdust;
4. To provide a novel and improved pellet mill die which lends itself to servicing in a more economical manner;
5. To provide a novel and improved pellet mill die which may be converted to produce pellets of different cross sections;
6. To provide a novel and improved pellet mill die which may be adjusted to obtain maximum uniformity in the extruded material.

Additional objects of my invention will be brought out in the following description of a preferred embodiment of the same taken in conjunction with the accompanying drawings wherein

Figure 1 is a view in section through a die constructed in accordance with the teachings of my invention;
Figure 2 is a plan view of the same;
Figure 3 is a fragmentary view looking at the under side of the die;
Figure 4 is a view depicting an adjusting nut in the die of the present invention.

Referring to the drawings for details of my invention in its preferred form, the same comprises a die 1 having a compression wall 3, an extrusion wall 5 and means in the form of spacing walls 7 and 9 to maintain the compression and extrusion walls in spaced relationship to each other to define a die chamber 11.

The compression wall in the specific embodiment of the invention illustrated, is in the form of a heavy circular disk having a peripheral bolting flange 13 and a central shaft opening 15. Throughout the compression area of the disk, the disk is provided with a pattern of die holes 17, with each die hole counter bored to provide a recess 19 about such hole.

The extrusion wall 5 of the die may be of lighter construction, and is provided with a similar pattern of die holes 21, with each hole in alignment with the corresponding hole 17 in the compression wall.

The spacing walls 7 and 9 are cylindrical and concentric, both being welded to the extrusion wall along the inner and outer rims thereof respectively, to form a unit assembly therewith, which assembly is adapted to be removably secured to the compression wall. This is accomplished by fitting the inner of the concentric spacing walls into a groove 23 in the under side of the compression wall, and providing the outer of the spacing walls with a bolting flange 25 adapted to match that of the compression wall and thus permit of the use of bolts 27 to join the assembly with the compression wall of the die.

Inserted into the aligned die holes thus provided, are a plurality of die hole inserts 29, each comprising a tube 31 having a flange 33 at one end adapted to seat in a counter bore recess and preferably extend slightly above the surface of the compression wall, while at its other end, it protrudes beyond the extrusion wall of the die, the protruding section 35 being split by a plurality of longitudinal edge cuts 37 and threaded on a taper to receive an adjusting nut 39 for varying the internal diameter of such insert at its extrusion or discharge end.

To facilitate such adjustments, each nut has a flange 41 which is provided with peripheral notches 43 to receive a suitable wrench or turning tool.

 Provision is made for circulating a cooling medium such as water, freezezone or the like through the die chamber, in the course of which, the cooling medium will contact all of the die hole inserts and withdraw heat which may be generated in such inserts during an extrusion cycle, to maintain the same in a relatively cool operating condition.

In providing for such circulation, a hose or pipe fitting 45 is embodied in the outer cylindrical wall adjacent the extrusion wall, while a similar fitting 47 for discharge of the cooling medium is embodied in the same wall but at a point diametrically opposite and adjacent the compression wall, whereby the most effective flow of the cooling medium through the die chamber will be realized.

With the cooling medium flowing through the die, the probability of the die choking up with the pelleting material, due to the generation of excessive heat, is eliminated and greater efficiency in the functioning of the pellet mill will be realized due to the lower pressures required.

Leakage of the cooling medium from the die is prevented by suitable gaskets between the spacing walls and compression wall, and O-ring seals 49 about the inserts where they pass through the compression and extrusion walls. These O-rings are preferably staggered with respect to adjacent inserts, particularly when such inserts are closely arranged.

The adjustment at the discharge end of each insert may be utilized to adjust the pressure required in the formation of the pellet to cause it to form more uniformly.

Aside from the advantages derived from the cooling of the die, the utilization of inserts facilitates and renders more economical, the maintenance and servicing of the die.

In accordance with prior practice, when a die wore out, the entire die would have to be removed from the machine and replaced by a new one, which not only was costly, but necessitated tying up the machine for a substantial period of time.

With the new construction, the inserts take the brunt of the wear, and may be readily replaced with new ones when replacements are deemed desirable.

In forming the inserts, the passage through each is preferably flared on the order of one to three-thousandths of an inch, from a point at substantially the lower surface.
of the compression wall to the lower end. This not only reduces the resistance to movement of the compacted material through the insert, but permits of some slight expansion thereof and enables the adjustment at the lower end to function more effectively.

A further advantage attributable to the die construction described above, lies in the fact that the inserts may be formed with passages of different cross sectional design to produce pellets of different cross sectional shapes.

While the invention was described in the form of a flat die, it is applicable to dies of other forms, such as a ring die for example, and it is further apparent that whatever the form of the die, the invention is subject to alteration and modification without departing from the underlying principles involved. Accordingly, while I have disclosed the same in its preferred form and in considerable detail, I do not desire to be limited in my protection to such details except as may be necessitated by the appended claims.

I claim:

1. A pellet mill die comprising a compression wall having a pattern of holes therethrough, each bounded by a recess in said compression wall, an extrusion wall having a like pattern of holes therethrough, spacer wall means holding said compression wall and extrusion wall in spaced relationship with corresponding holes in alignment, and defining with said compression and extrusion walls, a die chamber, a die hole insert disposed in each pair of aligned holes and having a portion protruding beyond the extrusion wall, each of said inserts comprising a tube having a beveled flange at the compression end nesting in the associated recess, and its protruding end split and threaded, an adjusting nut threaded on said protruding end, means sealing each said insert to said compression and extrusion walls, and means for circulating a cooling medium through said die chamber.

2. A pellet mill die comprising a compression wall having a pattern of holes therethrough, each bounded by a recess in said compression wall, an extrusion wall having a like pattern of holes therethrough, spacer wall means holding said compression wall and extrusion wall in spaced relationship with corresponding holes in alignment, and defining with said compression and extrusion walls, a die chamber, a die hole insert disposed in each pair of aligned holes and having a portion protruding beyond the extrusion wall, each of said inserts comprising a tube having a beveled flange at the compression end nesting in the associated recess, means for adjustably constraining the protruding ends of said die hole inserts, means sealing each said insert to said compression and extrusion walls, and means for circulating a cooling medium through said die chamber.

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