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EXTRUSION MILL FEED ASSEMBLY

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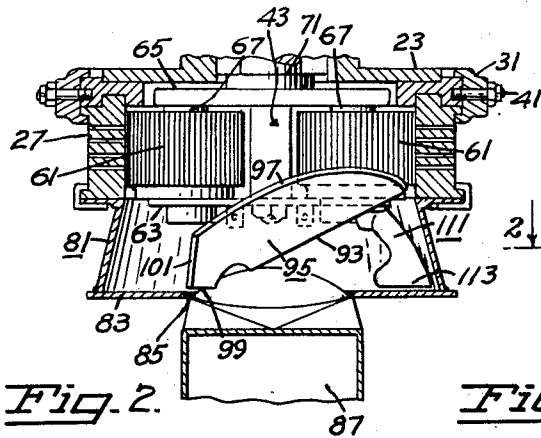


Fig. 2.

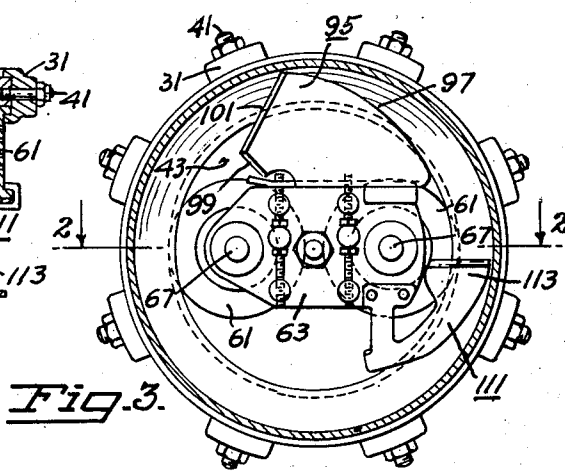


Fig. 3.

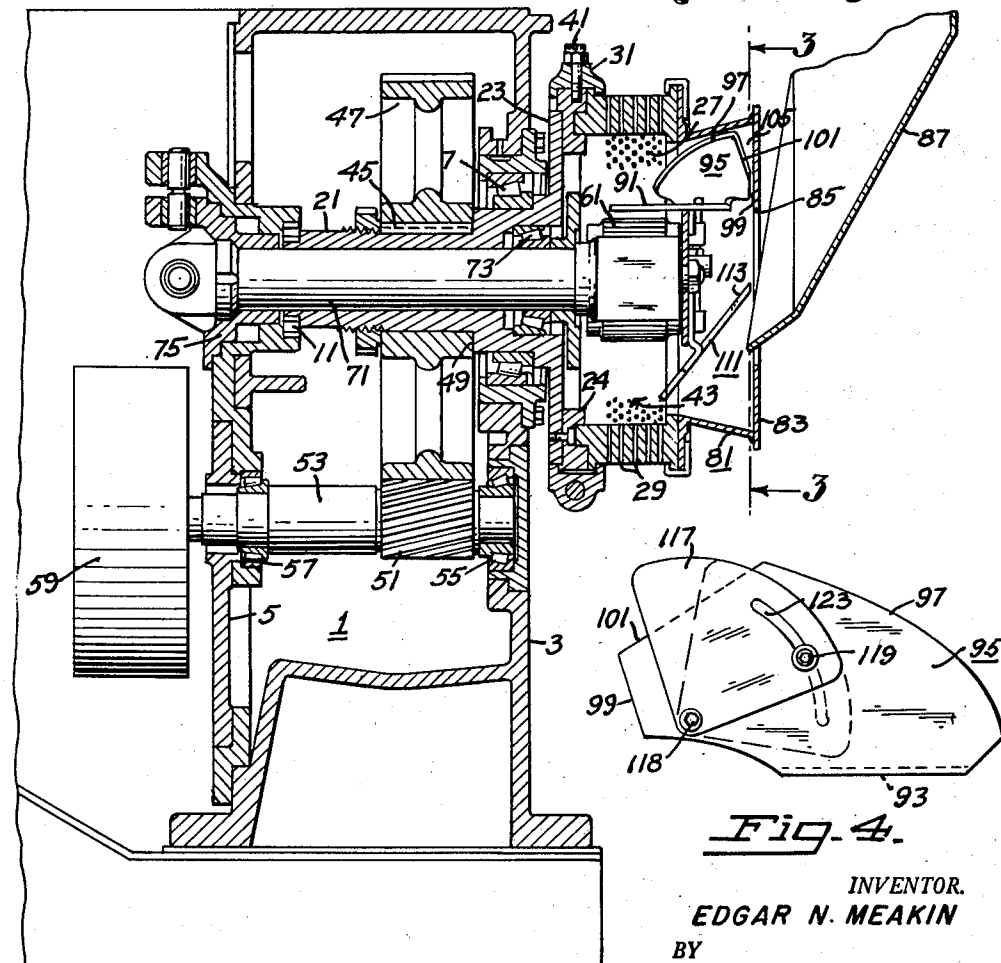


Fig. 1.

Fig. 4.

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EXTRUSION MILL FEED ASSEMBLY

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5 Claims. (Cl. 18—12)

My invention relates to extrusion mills and more particularly to the type in which material is extruded by a pair of extrusion members such as rollers, through the perforations of a ring die supported in a vertical plane.

One of the problems connected with the operation of such a mill is to, not only assure substantially equal rate of feed material to each of such rollers, but to also assure maximum feed to such rollers commensurate with the capacity of the rollers to extrude the material fed to them, whereby to obtain both a maximum and uniform output from the mill rollers. This is particularly important with respect to material of light weight and substantial bulk, as such material is rather difficult to handle in connection with the extrusion of the same.

Among the objects of my present invention are:

(1) To provide a novel and improved feed means for an extrusion mill of the type incorporating a ring die supported in a vertical plane;

(2) To provide a novel and improved feed means for an extrusion mill of the above type, which will increase the output of such mill and improve the efficiency thereof, particularly in the handling of light weight bulky material; and

(3) To provide a novel and improved feed means for an extrusion mill of the above type, which feed means may be adjusted to the character of material fed thereto.

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 side elevational view in section through an extrusion mill of the aforementioned type, with the present invention incorporated therein;

Figure 2 is a view partly in section, taken in the plane 2—2 of Figure 3;

Figure 3 is a view partly in section taken in the plane 3—3 of Figure 1, and retaining certain of the structural features in plan; and

Figure 4 is a view depicting an improvement in the inventive feature of Figures 1, 2 and 3.

Referring to the drawings for details of my invention in its preferred form, the mill construction involves a casing 1 having a front wall 3 and rear wall 5, each of which carries a bearing assembly 7 and 11 respectively, with the bearings in alignment.

Supported for rotation in the aforementioned bearing assemblies is a main drive sleeve 21 which extends beyond the front wall 3 and terminates in a die supporting and driving disk 23. This driving disk has a face ring 24 affixed thereto, which is provided with a circular recess in the front face thereof adjacent its periphery, to receive a cylindrical ring die 27 having preferably radial die holes 29 therethrough. The die is rigidly held in position on the driving disk ring by a plurality of locking keys 31 which are fixed in position by screws 41 passing through such keys and threading into the rim of the driving disk ring 24.

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The die and driving disk assembly form a die chamber 43 which is rotatable by reason of the sleeve 21 being supported in the bearings 7 and 11. This sleeve is provided with a key way 45, enabling a main drive gear 47 to be keyed thereto, the same being maintained in spaced relationship to the front bearing assembly 7 by a shoulder 49 on the sleeve.

Power is transmitted to the main drive gear 47 through a pinion 51 in mesh therewith, such pinion being carried by a pinion shaft 53 supported between the front and rear walls of the casing on bearing assemblies 55 and 57 respectively, carried thereby, such pinion shaft being keyed to an external pulley or other means 59 for applying rotational power to such shaft.

Located within the die chamber are a pair of extrusion means such as extrusion rollers 61 for cooperating with the ring die 27 in the extrusion of moldable material through the die holes. These rollers are mounted within a horizontally disposed cage comprising front and rear end plates 63 and 65 respectively, which serve to carry the spindles 67 about which the rollers revolve.

The rear end plate 65 is fixed to the end of a shaft 71, which in turn passes axially through the main drive sleeve 21. It is supported adjacent the front wall 3 in a bearing assembly 73 carried within the sleeve 21 which has been enlarged at this point for such purpose. The end of the shaft remote from the roller assembly is supported in a central hub 75 constituting part of the rear wall bearing assembly 11, the shaft being keyed therein to prevent rotational movement of the shaft.

As thus far described, the roller assembly is fixed, while the die 27 is rotatable through the application of power to the main drive gear 47, thus bringing about relative movement between the extrusion rollers and the ring die.

The material to be molded is fed into the die chamber 43 through an outwardly flaring housing 81 mounted at its smaller end to the rim of the ring die and having a front wall 83 with an aperture 85 therein through which moldable material may be fed into the housing by means of a suitable chute 87.

The outwardly flaring housing, being mounted on the ring die, it will rotate with such die. Due to such rotation of the housing, material that is deposited therein from the chute, will be directed against the flaring wall thereof by centrifugal force and carried around with rotational movement of the housing while continued feeding of the material from the chute will cause some of the material to find its way directly into the lower half of the extrusion chamber 43 where it will be carried by the die into the pocket formed by the die and one of the extrusion rollers.

The outwardly flaring character of the housing enables the housing to accommodate a substantial volume of light bulky material, such ability being one of the important requirements of the present invention.

To assure an adequate supply of such material to both the aforementioned roller and the upper half of the extrusion chamber where it may be extruded by the second extrusion roller, I provide a substantially horizontal shelf 91 just above the extrusion rollers in the upper portion of the extrusion chamber, such shelf being supported on the front plate 63. This shelf extends out into the outwardly flaring housing, where it terminates in an angularly disposed edge 93 directed inwardly toward the pocket formed by the second extrusion roller and the inner surface of the ring die.

Along such edge and preferably at an acute angle to the shelf is a guide flange 95, which extends upwardly with its upper edge 97 in proximity to the flaring wall of the housing 81. Due to the conical slope of the flaring wall and the direction in which the flange extends into

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the housing, the upper edge of the flange will take on a curvature substantially as depicted in the drawings.

At its outermost end, the flange terminates in an edge 99 lying parallel and in proximity to the plane of the front wall of the housing; and this front edge is connected to the upper curved edge 97 by an edge 101 which serves to straddle the corner formed between the flaring wall of the housing 81 and its front wall 83.

The flange 95 together with the shelf 91, constitute a scoop adapted to gather in from the upper region of the housing a substantial amount of the material carried up by the rotational movement of the housing. In this connection the outwardly flaring housing not only makes available a large volume of material for this purpose, but at the same time provides space for a scoop of substantial size so as to enable the same to segregate a large portion of this available supply.

Such material is exposed to pressure of material subsequently being carried up to said upper region, the material gathered into the scoop, particularly if light and bulky, becomes more and more compacted as it is forced into the extrusion pocket in the upper half of the die chamber and approaches the second roller. Thus, when the material is normally of a light, bulky character, a substantial degree of progressive compaction of the material takes place before extrusion. By reason of this, the extrusion means will operate on material of greater than original density with the result that denser and firmer pellets will be produced with an accompanying increase in the output and efficiency of the mill.

In shaping the the guide flange 95 to span the angle which the flaring wall of the housing makes with the front wall, an opening 105 of substantially triangular shape, is formed which permits of some of the material escaping past the flange. By making the flange of a particular size, the material carried up into the upper region of the housing may be so divided, that the material by-passing the scoop, when used to supplement that being fed directly to the first roller, will assure substantially the same amount being supplied to the first roller as is scooped up and directed to the second roller. By so proportioning and directing the material, the output of the machine, in addition to being increased, will at the same time be uniform as both rollers will be functioning under the same conditions.

To assure that such by-passed material will be directed to the first roller, I provide a guide 111 supported by a bracket from the lower right corner of the front plate 63 as viewed from the front of the machine. Such guide is in the form of a strip of metal supported at a vertical angle and having a broadened upper end 113 with a substantially horizontal bevelled edge in proximity to the front wall 83 of the housing 81 and its lower end terminating preferably at a point within the lower region of the die chamber, approximately in the plane of the outer rim of the die. With one long edge of the guide 111 following closely the inner or proximate surface of the outwardly flaring wall of the housing, essentially all the material by-passing the scoop, as well as any material picked up by the scoop but which might conceivably escape the associated roller, will be intercepted by the guide and directed thereby into the lower half of the die chamber to mingle with material directly fed thereto from the chute for extrusion by the first roller.

While the described guide flange, as part of the scoop, will function to advantage with materials of varying degrees of bulkiness, for some materials the ratio of division of the material in the upper region of the die chamber, will, for maximum results and efficiency, be somewhat different for some materials than for others. Consequently, a guide flange of fixed characteristics will increase the efficiency of a machine in varying amounts, depending upon the particular material being worked on.

To assure maximum output and efficiency for materials of different characteristics, particularly those falling with-

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in the light bulky category, I prefer to make the scoop adjustable so as to gather in more or less of a particular material.

One way of accomplishing this is to provide means for altering the effective area or extent of the flange 95, and this is made possible by the provision of a vane 117 pivotally secured to the flange at a point 118 which will permit the vane to be exposed, to a more or less degree, beyond the edge 101 of the flange, whereby to intercept more or less of a given material which is rotating with the housing. Such adjustment will be altered until the output and efficiency of the mill for the particular material becomes a maximum. The final adjustment may then be set by means of a locking bolt 119 passing through a bolt hole in the flange and an arcuate slot 123 in the vane.

From the foregoing description of my invention, it will be apparent that the same is subject to alteration and modification without departing from the underlying principles involved and I accordingly do not desire to be limited in my protection to the specific details illustrated and described except as may be necessitated by the appended claims.

I claim:

1. In an extrusion mill, a perforated ring die, means supporting said ring die with its axis substantially horizontal and defining therewith a die chamber, a pair of extrusion means disposed within said die chamber adjacent the inner face of said ring die along substantially the horizontal diameter thereof and adapted to extrude material through the perforations of said die upon rotation of said die, means for rotating said ring die, an outwardly flaring housing, means for affixing the same at its smaller end to said ring die for rotation therewith, said housing having a front wall at its larger end, means for supplying material into said rotatable housing, and means cooperating with said outwardly flaring housing while said housing is in rotation for segregating and directing a quantity of such material to the upper region of said die chamber and into the pocket formed by said ring die with one of said extrusion means, said cooperating means including a shelf within said ring die chamber above said one extrusion means and extending partly therefrom into said housing, said shelf terminating in said housing in an angularly disposed edge directed inwardly toward said pocket, and a flange extending upwardly from said edge toward the walls of said housing and terminating short thereof at certain points to leave an opening for material to by-pass said flange.

2. In an extrusion mill, a perforated ring die, means supporting said ring die with its axis substantially horizontal and defining therewith a die chamber, a pair of extrusion means disposed within said die chamber adjacent the inner face of said ring die along substantially the horizontal diameter thereof and adapted to extrude material through the perforations of said die upon rotation of said die, means for rotating said ring die, an outwardly flaring housing, means for affixing the same at its smaller end to said ring die for rotation therewith, said housing having a front wall at its larger end, means for supplying material into said rotatable housing, and means cooperating with said outwardly flaring housing while said housing is in rotation for segregating and directing a quantity of such material to the upper region of said die chamber and into the pocket formed by said ring die with one of said extrusion means, said cooperating means including a shelf within said ring die chamber above said one extrusion means and extending partly therefrom into said housing, said shelf terminating in said housing in an angularly disposed edge directed inwardly toward said pocket, and a flange extending upwardly from said edge, said flange extending approximately to said front wall and spanning the corner formed by the front wall of said housing with the outwardly flaring wall thereof to leave an opening at such corner for material to by-pass said flange.

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3. In an extrusion mill, a perforated ring die, means supporting said ring die with its axis substantially horizontal and defining therewith a die chamber, a pair of extrusion means disposed within said die chamber adjacent the inner face of said ring die along substantially the horizontal diameter thereof and adapted to extrude material through the perforations of said die upon rotation of said die, means for rotating said ring die, an outwardly flaring housing, means affixing the same at its smaller end to said ring die for rotation therewith, said housing having a front wall at its larger end, means for supplying material into said rotatable housing, and means cooperating with said outwardly flaring housing while said housing is in rotation for segregating and directing a quantity of such material to the upper region of said die chamber and into the pocket formed by said ring die with one of said extrusion means, said cooperating means including a shelf within said ring die chamber above said one extrusion means and extending partly therefrom into said housing, said shelf terminating in said housing in an angularly disposed edge directed inwardly toward said pocket, and a flange extending upwardly from said edge and into proximity with and contoured to conform to the outwardly flaring wall of said housing, said flange extending approximately to said front wall and spanning the corner formed by the front wall of said housing with the outwardly flaring wall thereof to leave an opening at such corner for material to by-pass said flange, and means for altering the extent of such opening.

4. In an extrusion mill, a perforated ring die, means supporting said ring die with its axis substantially horizontal and defining therewith a die chamber, a pair of extrusion means disposed within said die along substantially the horizontal diameter thereof and adapted to extrude material through the perforations of said die upon rotation of said die, means for rotating said ring die, an outwardly flaring housing, means affixing the same at its smaller end to said ring die for rotation therewith, said housing having a front wall at its larger end, means for supplying material into said rotatable housing, means cooperating with said outwardly flaring housing while said housing is in rotation for segregating and directing a quantity of such material to the upper region of said die chamber and into the pocket formed by said ring die with one of said extrusion means, said cooperating means including a shelf within said ring die chamber above said one extrusion means and extending partly therefrom into said housing, said shelf terminating in said housing in an angularly disposed edge directed inwardly toward said pocket, and a flange extending upwardly from said edge and into proximity with and contoured to conform to the outwardly flaring wall of said

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housing, said flange extending approximately to said front wall and spanning the corner formed by the front wall of said housing with the outwardly flaring wall thereof to have an opening at such corner for material to by-pass said flange, means for altering the extent of such opening, and means for intercepting and guiding to said other extrusion means material which may have by-passed said flange.

5. In an extrusion mill, a perforated ring die, means supporting said ring die with its axis substantially horizontal and defining therewith a die chamber, a pair of extrusion means disposed within said die chamber adjacent the inner face of said ring die along substantially the horizontal diameter thereof and adapted to extrude material through the perforations of said die upon rotation of said die, means for rotating said ring die, an outwardly flaring housing, means affixing the same at its smaller end to said ring die for rotation therewith, said housing having a front wall at its larger end, means for supplying material into said rotatable housing, means cooperating with said outwardly flaring housing while said housing is in rotation for segregating and directing a quantity of such material to the upper region of said die chamber and into the pocket formed by said ring die with one of said extrusion means, said cooperating means including a substantially horizontal shelf within said ring die chamber above said one extrusion means and extending partly therefrom into said housing, said shelf terminating in said housing in an angularly disposed edge directed inwardly toward said pocket, and a flange extending upwardly from said edge and into proximity with and contoured to conform to the outwardly flaring wall of said housing but terminating short thereof at certain points to have an opening for material to bypass said flange, and said flange defining with said shelf a scoop adapted to receive from said housing material for compaction and guidance to said one extrusion member for extrusion through said die, and means for intercepting and guiding to said other extrusion means material which may have by-passed said scoop, said intercepting and guiding means comprising a strip disposed to one side in said housing at a vertical angle, with its upper end having a substantially horizontal edge in proximity to the front wall of said housing and with its lower end terminating approximately in the plane of the outer rim of said ring die, said strip having one of its longer edges in proximity to the outwardly flaring wall of said housing and contoured thereto.

References Cited in the file of this patent

UNITED STATES PATENTS

2,757,621	Johnson	Aug. 7, 1956
2,764,951	Fisher	Oct. 2, 1956