Dec. 20, 1938. W. H. LUSSIE 2,141,005

TUBE EXTRUDING DIE

Filed Aug. 28, 1937 2 Sheets-Sheet 1

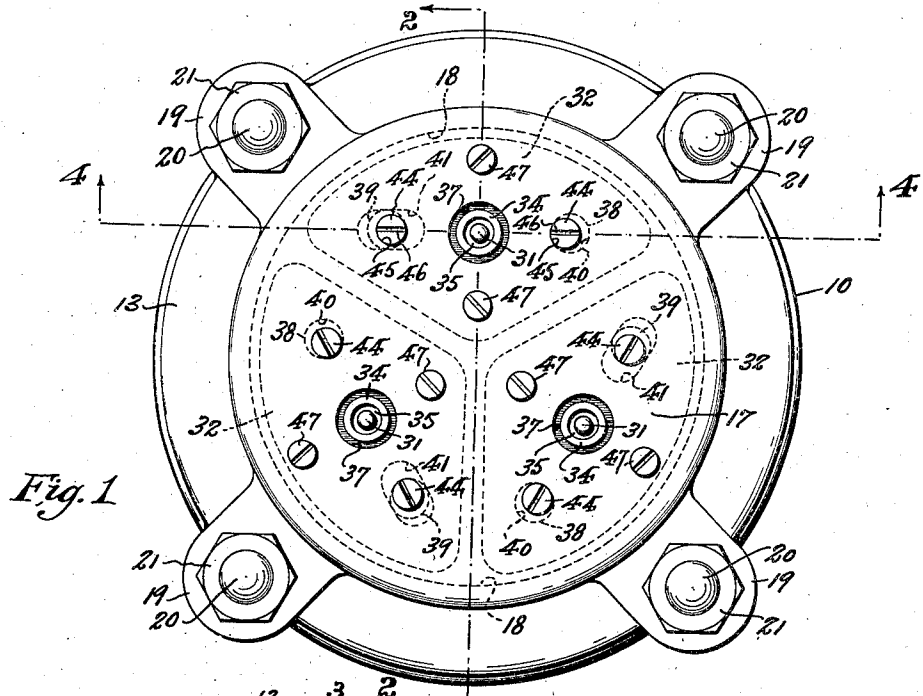


Fig. 1

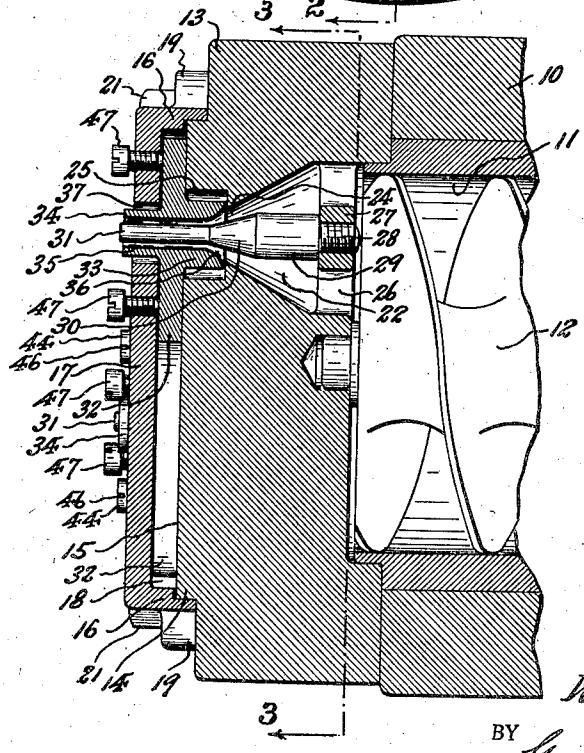


Fig. 2

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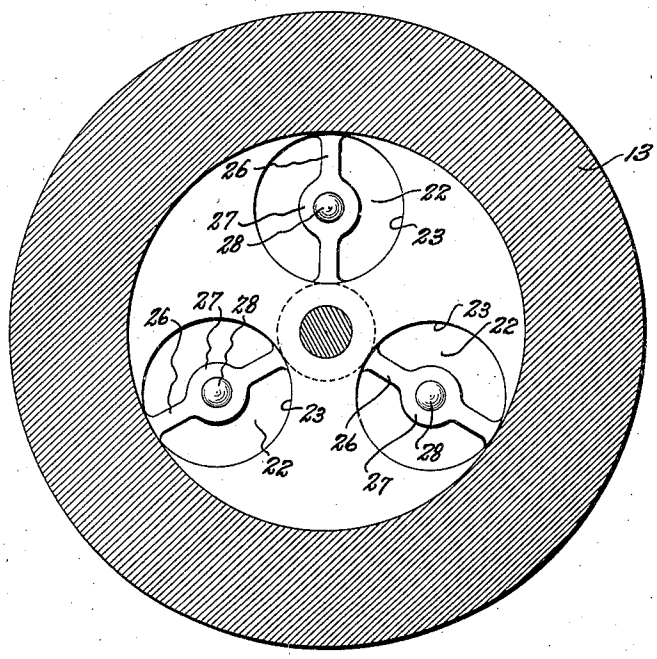


Fig. 3

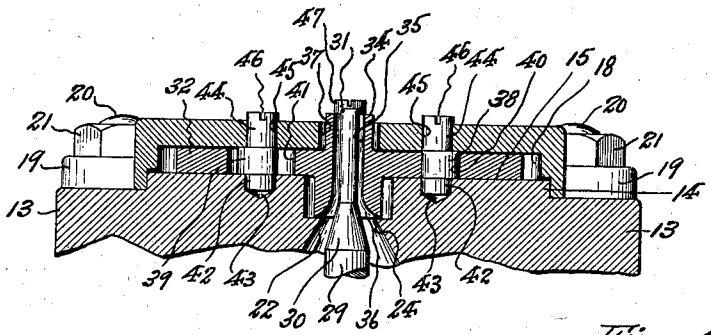


Fig. 4

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2,141,005

TUBE EXTRUDING DIE

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5 Claims. (Cl. 18—14)

This invention relates generally to improvements in apparatus for producing tubular bodies by extrusion of plastic material around a core centered in a die opening; and the invention has reference, more particularly, to an improved construction of die box equipped with one or more stationary cores and cooperating die-plates to and through which plastic tube forming material is adapted to be fed by means of a single screw conveyer and feeder.

This invention has for an object to provide a novel construction of die box having improved means for adjusting a die-plate relative to a fixed core; the improved construction being especially adapted to permit the mounting and use, in connection with the die box, of a plurality of cores and independently adjustable cooperating die-plates, all in such manner that tube forming material may be fed and distributed thereto by means of a single screw conveyer and feeder.

The invention has for another object to provide a novel means for mounting, adjusting and locking up movable die-plates relative to cores serving therewith; the adjusting and locking means being easily and quickly manipulatable at the exterior front face of the die box.

The invention also provides a compact die box, having a plurality of adjustable die-plates for cooperation with a corresponding plurality of fixed core elements, which is especially suitable for use in apparatus for forming rubber tubing by extrusion methods; the construction and arrangement being such that the capacity of the extrusion press is greatly increased without necessity for enlarging the die box per se beyond that of the ordinary single die form heretofore commonly in use, while, nevertheless, assuring that full and individual control of the formation of each tube expressed therefrom is easily and quickly attainable by simple manipulations of novel adjusting means with which each said die-plate is equipped.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed description of the same.

An illustrative embodiment of the invention is shown in the accompanying drawings, in which:

Fig. 1 is a front end elevation of the die box of a tubing extrusion press according to this invention; Fig. 2 is a vertical longitudinal section therethrough, taken on line 2—2 in Fig. 1; Fig. 3 is a transverse vertical section therethrough, taken on line 3—3 in Fig. 2; and Fig. 4 is a horizontal section therethrough, taken on line 4—4 in Fig. 1.

Similar characters of reference are employed in the above described views, to indicate corresponding parts.

Referring to the drawings, the reference character 10 indicates the casing of an extrusion press having a cylindrical bore 11 in which is rotatably operative a screw feeder 12 adapted to feed a plastic mass of tube making material, such e. g. as rubber stock, to tube forming dies. Suitably connected to and across the outer end of said casing 10 is a die box or head 13. At its outer end, said die box 13 is provided with a boss 14 of reduced diameter, the outer face 15 of which provides a die-plate seating face. Telescopically fitted over said boss 14 is the circumferential or annular skirt flange 16 of a cap-plate 17, the interior transverse face of the latter being spaced outwardly from said die-plate seating face 15 of the boss 14, thus providing an intermediate die-plate housing chamber 18. Said cap-plate 17 may be detachably secured to the die box 13 by any suitable fastening means, such e. g. as the radial anchor lugs 19 adapted to be engaged by bolts 20, and secured by nuts 21 turned onto the latter.

In the illustrative embodiment of this invention, as shown in the accompanying drawings, the arrangement is such that a plurality of extrusion outlets are provided, all of which are adapted to be fed with tube making stock from a common source by the single screw feeder 12. In the accompanying drawings three such extrusion outlets are provided, but it will be obvious that more or less than three thereof might optionally be provided.

The extrusion outlets are formed by die-openings and cooperating cores to which the die openings are to be respectively disposed in concentric relation. Suitably formed and located in the body of said die box or head 13 are outwardly tapered discharge chambers 22, the rearward larger ends of which provide intake ports 23 which communicate with the bore 11 through which the tube making stock is fed by the screw feeder 12. The outwardly disposed restricted open ends of said discharge chambers 22 provide outlet ports 24 which communicate with diametrically enlarged sockets 25 arranged to open outwardly from the seating face 15 of the boss 14 at the front of said die box or head 13.

Extending across said intake ports 23 are bridge members 26 provided with internally threaded hubs 27 axially aligned with said chambers 22. Supported by said hubs 27, which receive their

threaded butts 28, are core bases 29; the latter having tapered outer end portions 30 terminating in outwardly projecting cylindrical core elements 31 of a diameter corresponding to the bores of the tubes desired to be made.

Disposed in the housing chamber 18 intermediate the seating face 15 of said die box or head and said cap-plate 17 are a plurality of sector-shaped die-plates 32 to respectively cooperate with the discharge chambers 22. Each die-plate 32 is provided with a rearwardly extending boss 33 and a forwardly extending boss 34 disposed in mutually aligned axial relation. Extending through the die-plates and their said bosses 33—34 are die bores or passages 35, the diameters of which correspond to the external diameters of the tubes desired to be made. The rearwardly extending bosses 33 are of substantially smaller diameters than are the sockets 25 of the die box or head into which they extend, to allow for adjusting movement of the die-plates from which they extend. The die bores or passages 35, where terminating in said bosses 33, are formed to provide outwardly flaring receiving mouths 36 which are opposed to and which communicate with the outlet ports 24 of the discharge chambers 22 in said die box or head. When assembled with the die box or head, said die-plates 32 are so disposed that the core elements 31 extend axially through the die bores or passages 35 thereof, thus forming the operative annular extrusion outlets of the apparatus. The cap plate 17 is provided with openings 37 through which the forwardly extending bosses 34 project, the former being of larger diameter than the latter to allow for adjusting movement of the die plates from which said bosses extend.

In order to assure that the extruded tubes are produced with uniform wall thickness all around, and that said extruded tubes will run straight and true without bends, and without tendency to curl as the same emerge from the extrusion outlets, it is required that the die bores or passages 35 of the die plates 32 be disposed, relative to the core elements 31 with which they cooperate, in accurately spaced and true concentric relation to said core elements 31. To easily and quickly assure the attainment of such relation, each die-plate is provided with a novel and easily manipulable means for adjusting the same and their die bores or passages relative to the stationary core elements. Said adjusting means for each die-plate comprises, a pair of adjusting eccentrics 38 and 39 disposed in spaced apart relation respectively offset from opposite sides of the die bore or passage of the die-plate. The adjusting eccentric 38 engages an opening 40 in the die-plate which conforms to the periphery of the former, and manipulation of this eccentric 38 produces a compound movement of the die-plate both endwise and transversely. The adjusting eccentric 39 engages a slot 41 in the die-plate of a width conforming to the diameter of the former, and manipulation of said eccentric 39 produces but transverse movements of the die-plate. Said eccentrics 38 and 39 are provided with inner trunnions 42 journaled in bearing sockets 43 with which the die box or head is provided, and said eccentrics are further provided with outer trunnions 44 journaled in and projecting outwardly from bearing openings 45 with which the cap-plate 17 is provided. The outer ends of said trunnions 44 are provided with cross slots 46 for application thereto of a tool, such e. g. as a screw-driver, for turning the eccentrics to manipulate the die-plates with adjusting effect; or any other suitable tool receiving means may be utilized in connection with and for actuating said eccentrics. It will be obvious, that by manipulating the eccentrics 38—39, movement of the die-plates in any direction in the planes thereof may be attained, so that the bosses 33—34 may be shifted laterally in any direction necessary to bring the bores or passages 35 into proper and true concentric relation to the associated core elements 31, to thereby assure annular extrusions outlets calculated to form the tube making material into a tube having uniform wall thickness throughout, and free from longitudinal bends or kinks.

In order to retain the die-plates against accidental shifting or displacement from the operative positions to which they have been adjusted, each die-plate is served by one or more set screws 47 which are threaded through the cap-plate 17 so as to engage the outer faces of the die-plates and force the same rearwardly into abutting relation to the die box or head, with their rearward faces strongly bound frictionally to the seating face 15 of said die box boss 14.

From the above description it will be understood that, not only does the present invention provide a novel means per se for adjusting a die aperture relative to an associated core to obtain a true concentric annular extrusion outlet, but, furthermore, provides an arrangement which admits of the employment of a plurality of extrusion outlets in connection with a single die box or head, and so as to be fed with tube making stock by means of a single screw feeder or the like, thus greatly increasing the capacity of extrusion press.

It will be understood that various changes may be made in the above described constructions, and that many apparently widely different embodiments of this invention may be made without departing from the scope thereof as defined by the following claims. It is therefore intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:—

1. In mechanism for extruding tubular formations, a die box having a plurality of discharge chambers, fixed core elements within said chambers, said die box having a transverse seating face at its outer end, a cap-plate in spaced opposed relation to said die box seating face and forming therewith an intermediate die-plate housing chamber, movable die-plates in said housing chamber having extrusion passages with which said core elements respectively cooperate, eccentric cam means cooperating with said die-plates and manipulatable from the exterior face of said cap-plate for independently adjusting said die-plates to dispose their extrusion passages in concentric relation to the core elements extending therethrough, and means to secure said die-plates in adjusted positions.

2. In mechanism for extruding tubular formations, a die box having a plurality of discharge chambers, fixed core elements within said chambers, said die box having a transverse seating face at its outer end, a cap-plate in spaced opposed relation to said die box seating face and forming therewith an intermediate die-plate housing chamber, movable die-plates in said housing chamber having extrusion passages with which said core elements respectively cooperate, eccentric cam means cooperating with said die-plates

and manipulatable from the exterior face of said cap-plate for independently adjusting said die-plates to dispose their extrusion passages in concentric relation to the core elements, and set-screws threaded through said cap-plate and manipulatable to force said die-plates when suitably adjusted into frictionally bound abutting relation to said die box seating face.

3. In a mechanism for extruding tubular formations, a die box having a discharge chamber, a fixed core element within said chamber, said die box having a transverse seating face at its outer end, a cap-plate in spaced opposed relation to said die-box seating face and forming therewith an intermediate die-plate housing chamber, a die-plate movably seated upon said seating face, said die-plate having a boss projecting from its outer face, said die-plate having an extrusion passage to communicate at its inner end with said die box discharge chamber and having its outer open end extending through said boss, said core element cooperating with said extrusion passage, said cap-plate having an opening diametrically larger than said boss through which the latter exteriorly projects, die-plate adjusting eccentrics journaled in and between said die box and cap-plate and having portions exteriorly exposed from said cap-plate whereby the same may be manipulated, said adjusting eccentrics being engaged with said die-plate at spaced points respectively offset from opposite sides of the die-plate extrusion passage, said die-plate having an opening engaged by and conforming to the periphery of one eccentric and an elongated slot engaged by and conforming in width to the diameter of the other eccentric, and means to secure said die-plate in adjusted position.

4. In a mechanism for extruding tubular formations, a die box having a plurality of discharge chambers symmetrically spaced about the axis thereof, fixed core elements within said chambers, said die box having a transverse seating face at its outer end, a cap-plate in spaced opposed relation to said die box seating face and forming therewith an intermediate die-plate housing chamber, a plurality of sector-shaped die-plates movably seated upon said seating face, said die-plates having central extrusion passages respectively communicating with said discharge passages and with which said core elements respectively cooperate, adjusting eccentrics engaged with each die-plate at spaced points respectively offset from opposite sides of its extrusion passage, one eccentric being operative to shift the die-plate by a compound endwise and transverse movement and the other being operative to shift the die-plate merely by a transverse movement, and means to secure said die-plates in adjusted positions.

5. In a mechanism for extruding tubular formations, a die box having a plurality of discharge chambers symmetrically spaced about the axis thereof, fixed core elements projecting outwardly from said chambers, said die box having a transverse seating face at its outer end, a cap-plate in spaced opposed relation to said die box seating face and forming therewith an intermediate die-plate housing chamber, a plurality of sector-shaped die-plates movably seated upon said seating face, said die-plates having central extrusion passages respectively communicating with said discharge passages and through which said core elements respectively extend, adjusting eccentrics engaged with each die-plate at spaced points respectively offset from opposite sides of its extrusion passage, said die-plate having an opening engaged by and conforming to the periphery of one eccentric and an elongated slot engaged by and conforming in width to the diameter of the other eccentric, said eccentrics having means externally projected from said cap-plate for actuating the same, and manipulatable means carried by said cap-plate for securing said die-plates in adjusted positions.

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