Dec. 25, 1951 S. M. MARTIN 2,579,747

COMPOUND FEEDING APPARATUS

Filed May 28, 1949 3 Sheets-Sheet 1

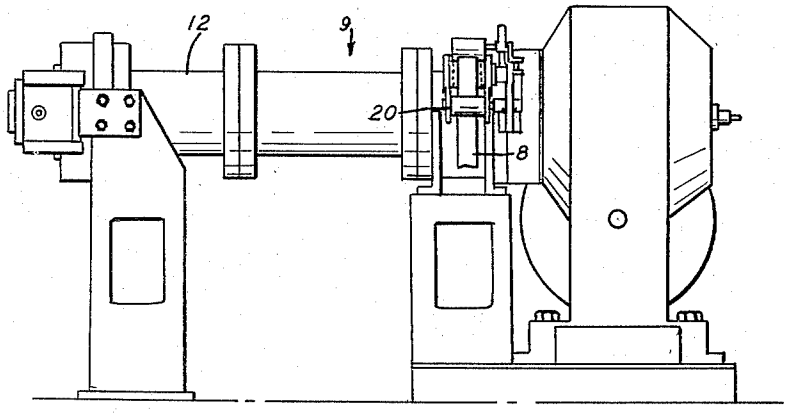

FIG. 1

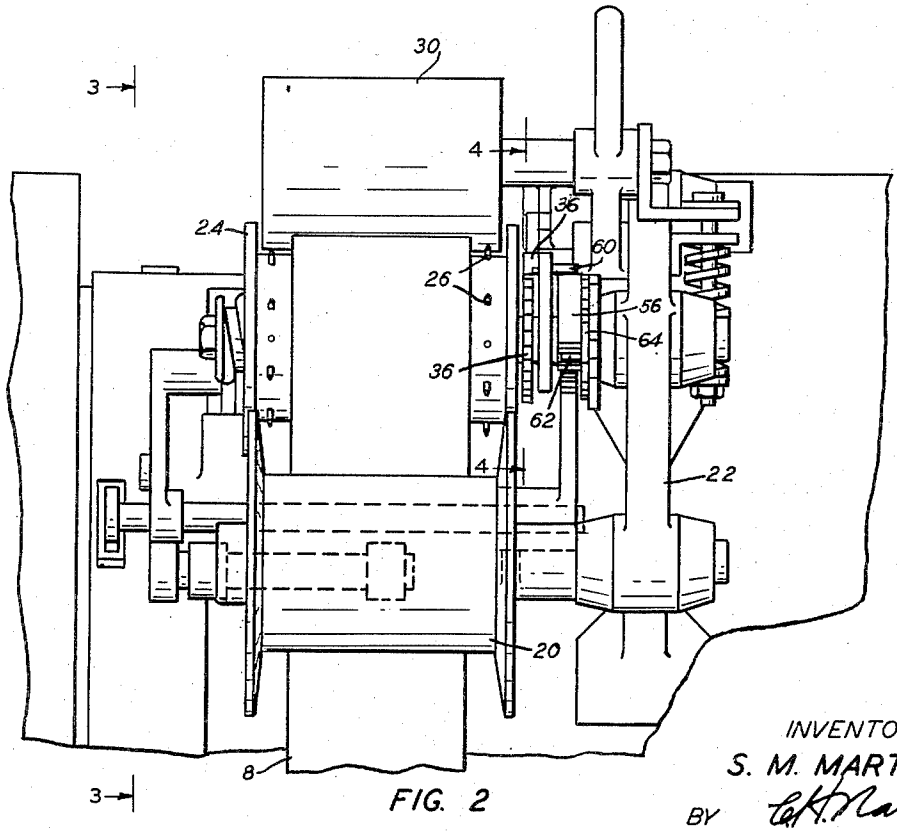

FIG. 2

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COMPOUND FEEDING APPARATUS

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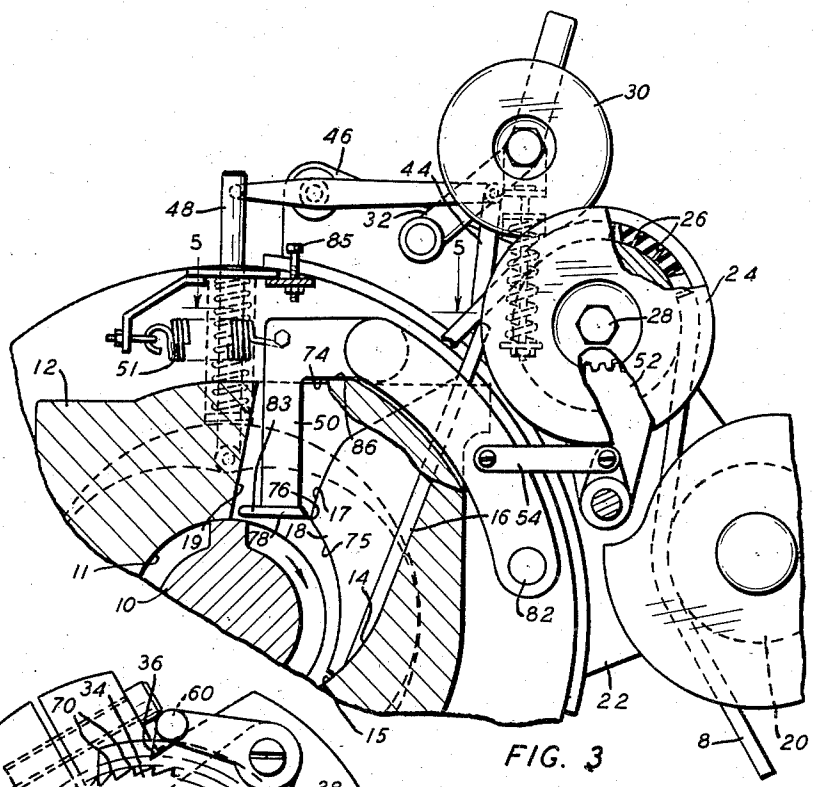

FIG. 3

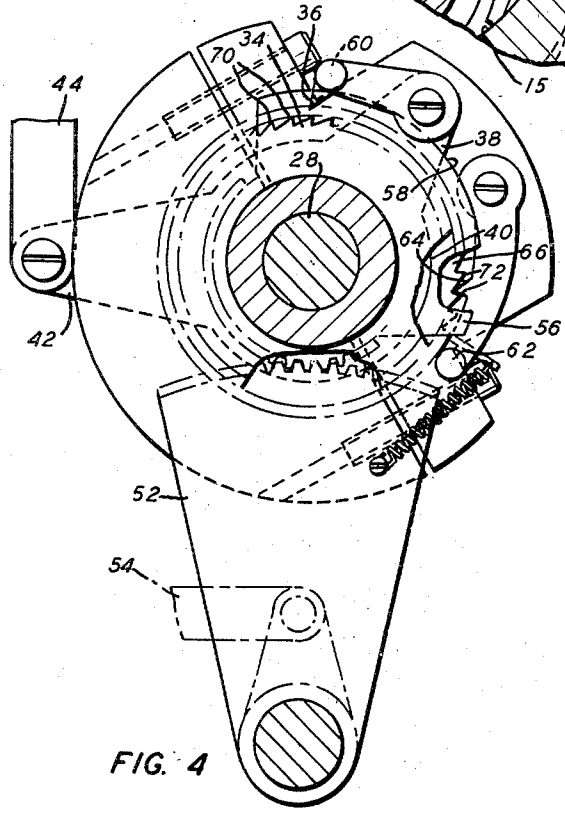

FIG. 4

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COMPOUND FEEDING APPARATUS

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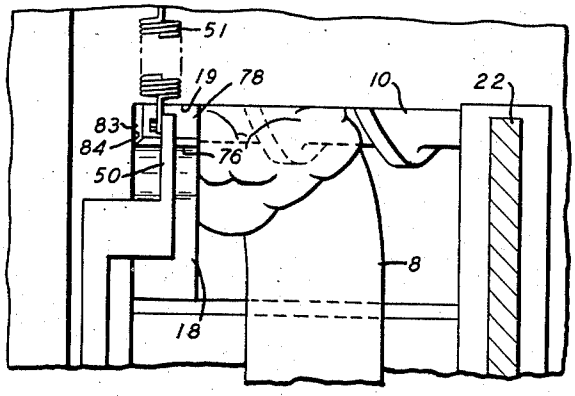

FIG. 5

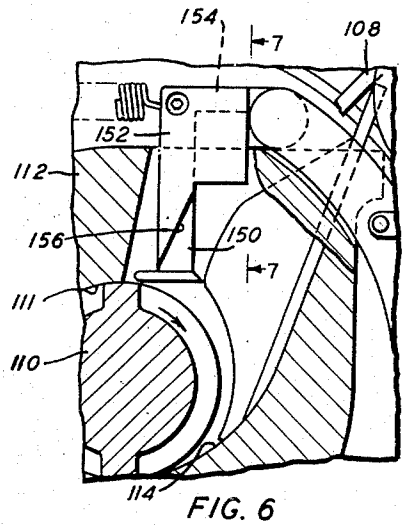

FIG. 6

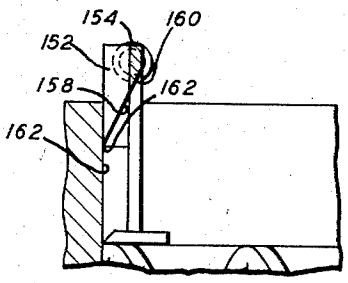

FIG. 7

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2,579,747

UNITED STATES PATENT OFFICE

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COMPOUND-FEEDING APPARATUS

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7 Claims. (Cl. 18—12)

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This invention relates to compound-feeding apparatus, and more particularly to apparatus for regulating the feed of strips of elastomer compounds into extrusion machines.

In the operation of extrusion machines, a tough elastomer compound sometimes is advanced to a machine in strip form by an automatic feeder. With feeding devices known hitherto, the compound frequently is pulled to the machine too rapidly for the machine to handle and the feed throat of the machine becomes clogged.

An object of the invention is to provide new and improved compound-feeding apparatus.

A further object of the invention is to provide new and improved apparatus for regulating the feed of strips of elastomer compounds into extrusion machines.

Another object of the invention is to provide new and improved apparatus for feeding a strip of compound to an extruder and for preventing positively accumulation of excess compound in a feed throat of the extruder.

An apparatus illustrating certain features of the invention may include a strip-feeding means for engaging positively a strip of material, means for actuating the strip-feeding means to feed a strip of material, and means for locking the strip-feeding means positively to prevent feed of material therepast.

A complete understanding of the invention may be obtained from the following detailed description of apparatus forming specific embodiments thereof, when read in conjunction with the appended drawings, in which:

Fig. 1 is a side elevation of an apparatus embodying certain features of the invention;

Fig. 2 is an enlarged, fragmentary side elevation of a portion of the apparatus shown in Fig. 1;

Fig. 3 is a fragmentary, vertical section taken along line 3—3 of Fig. 2;

Fig. 4 is a fragmentary, vertical section taken along line 4—4 of Fig. 2;

Fig. 5 is a fragmentary, horizontal section taken along line 5—5 of Fig. 3;

Fig. 6 is a fragmentary, vertical section taken of a portion of an apparatus forming a second embodiment of the invention, and

Fig. 7 is a fragmentary, vertical section taken along line 7—7 of Fig. 6.

Referring now in detail to the drawings, a wide strip 8 composed of an elastomer compound, such as a compound including polymerized chloroprene, rubber, Buna-S, or the like, is advanced to an extrusion machine 9 having a stock screw 10 (Fig. 3) positioned in a bore 11 in an extrusion cylinder 12. The strip 8 is fed to the stock screw

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through a feed throat 14, which terminates in a crescent-shaped recess 15 at the bottom of the bore 11 so that the strip will be drawn under the stock screw and forced along the extrusion cylinder. A feed plate 16 guides the strip into the crescent-shaped recess, and an edge 17 of a lug 18 forms a notch 19 (Fig. 5) with adjacent walls of the feed throat.

In order to insure an adequate supply of material in the extrusion cylinder 12, the crescent-shaped recess 15 is formed so that the stock screw 10 will normally draw the compound into the cylinder faster than it can be used by the extruding apparatus. Therefore, the supply must be retarded so that the surplus of compound will not become too great. The strip is advanced from a source of supply (not shown), and is passed under a guide roll 20 secured to an upright 22 to a feed roll 24, which has impaling pins 26—26 for engaging the strip positively and is mounted rotatably on an arbor 28 projecting from the upright 22. A roll 30 mounted on a pivotal arm 32 presses against the strip to hold it against the feed roll 24. The roll 24 is driven in a direction tending to feed the strip 8 into the extrusion machine 9 through a drive ratchet wheel 34 fastened rigidly thereto, a drive pawl 36 mounted on an arm 38 projecting from a collar 40, and a drive arm 42 of the collar connected by a link 44 to a rocker arm 46 driven by a post 48 reciprocated by the drive of the stock screw. Whenever the pawl 36 is in engagement with the ratchet wheel 34, the drive of the feed roll 24 is positive, and the pawl 36 is urged by gravity toward driving engagement with the ratchet wheel 34.

A feeler 50 is urged by a spring 51 generally downwardly in the feed throat 14, and presses the compound fed to the extruder against the stock screw 10. When an excess of the compound starts to build up under the feeler 50 from the pulling action of the stock screw on the strip 8, the feeler is pivoted in a clockwise direction, as viewed in Fig. 3, and turns a gear segment 52 through a link 54 in a clockwise direction. Such movement of the gear segment 52 turns a cam 56 in a counterclockwise direction to move a lobe 58 of the cam under a pin 60 secured to the drive pawl 36 to hold the pawl 36 out of engagement with the drive ratchet wheel 34, thereby stopping drive of the feed roll 24 for the portion of the movement of the pawl 36 in which the pin 60 engages the lobe 58 of the cam 56. The length of the feed is controlled to the extent that the lobe 58 remains under the pin 60 of the pawl 36 so that a variable feed stroke is provided.

If the compound piles up to an extent approach-

ing a clogging condition of the feed throat 14, the feeler 50 is pivoted to such an extent that the cam lobe 58 is under the pin 60 for the entire stroke of the drive pawl 36 so that no drive of the feed roll 24 occurs. When the cam lobe 58 is moved to this position, the cam lobe is moved out of engagement with a pin 62 carried by a spring-pressed brake pawl 64, and the pawl 64 engages a brake ratchet wheel 66 connected rigidly to the feed roll 24 to lock the feed roll 24 positively against feed, thereby preventing rotation of the feed roll 24 so that the strip of compound cannot be pulled into the extruder by the feeding movement of the stock screw 10 thereon. When the condition approaching clogging the feed throat is relieved, the compound under the feeler 50 has been moved from under the feeler, and the feeler moved in a counterclockwise direction, as viewed in Fig. 3, to turn the gear segment 52 to a position in which it turns the cam 56 to a position lifting the pawl 64 out of engagement with the brake ratchet wheel 66 and from under the pin 60 of the pawl 36 so that the pawl 36 drives the feed roll 24 in its oscillations.

Teeth 70—70 of the feed ratchet wheel 34 are directed in a generally clockwise direction, as viewed in Fig. 4, so that there is a positive drive to the feed roll 24 in a counterclockwise direction from the pawl 36. Conversely, teeth 72—72 of the brake ratchet wheel 66 are directed in a generally counterclockwise direction so that the pawl 64 serves to lock the feed roll against counterclockwise movement. The length of the lobe 58 on the cam 56 and the distance between the pins 60 and 62 of the pawls 36 and 64, respectively, are such that it is possible for only one of these pawls to be in engagement with its associated ratchet wheel 34 or 66 at any particular time.

The lug 18 guides the strip 8 to the screw 10 transversely with respect to the screw, and prevents compound from accumulating under an arm 74 (Fig. 3) of the feeler 50 and jamming it. An edge 75 of the lug spaced from the screw permits compound to enter between it and the screw, and wedges the compound into the screw so that the screw is constantly filled. A sharp edge 76 of a shoe 78 of the feeler scrapes along the edge 17 of the lug which is concentric with a pin 82 on which the feeler is pivotally mounted, thereby preventing sticking therebetween, and tending to keep compound off the top of the shoe. A sharp edge 83 on the shoe 78, which scrapes against a wall 84 (Fig. 5) of the notch 19, prevents sticking of the shoe to the wall 84, and tends to keep compound off the top of the shoe. Stops 85 and 86 limit movement of the feeler.

Operation

The strip 8 is fed into the feed throat 14 to the stock screw 10 by the action of the stock screw pulling the strip thereto, the action of the feed roll 24 or these actions combined, until a predetermined amount of compound is accumulated in the feed throat 14, and the feed roll is free to overrun the drive thereof, thereby permitting the stock screw to pull the strip at its normal rate which is in excess of that needed for the extrusion operation of the extrusion machine. This maintains a surplus of compound at the feed throat so that the extrusion cylinder always is adequately supplied, and facilitates size control of the extruded product. The surplus of the compound feeds into the threads of screw as it is moved by the screw under the lug 18, as viewed in Fig. 3. As the compound accumulates in the feed throat 14, it overflows into the notch 19, and pushes the feeler 50 in a clockwise direction. This moves the cam 56 farther in a counterclockwise direction, as viewed in Fig. 4, thereby lessening the effective length of the feed stroke of the pawl 36. The compound continues to pile-up until the portion thereof overflowing into the notch 19 moves the feeler to an extent that the cam 56 releases the brake pawl 64 which engages the brake ratchet wheel 66. This positively locks the feed roll 24 against rotation and prevents further feed of the strip.

As the screw 10 carries the excess compound from under the shoe 78 (Fig. 3), the feeler 50 drops, to move the pawl 64 away from the ratchet wheel 66 and resume the drive of the feed roll 24 to begin another cycle of accumulation and removal of all compound more than a minimum surplus.

Modification shown in Figs. 6 and 7

In Figs. 6 and 7, there is shown another embodiment of the invention. The apparatus shown in Figs. 6 and 7 includes a stock screw 110 mounted rotatably in a bore 111 in an extrusion cylinder 112. A strip 108 is pushed and pulled into a feed throat 114 in the cylinder similarly to the feed of the strip 8 (Fig. 3) into the cylinder 12. A feeler 150 (Fig. 6) is generally similar to the feeler 50 (Fig. 3) but also includes a compound-clearer 152 (Fig. 6) fastened to an arm 154.

The compound-clearer is provided with an inclined surface 156 for pushing compound leaking to a position above the shoe, as viewed in Fig. 6, to the right. The compound-clearer also is provided with an inclined surface 158 forming a continuation of an inclined surface 160 formed on the arm 154 of the feeler for pushing the compound to the right, as viewed in Fig. 7, to clear the compound from under the feeler arm 154. A knife edge 162 on the compound-clearer scrapes along a wall 164 of the feed throat so that compound is kept off this wall. Except for the elements described hereinabove, the apparatus shown in Figs. 6 and 7 is identical in construction and operation with that shown in Figs. 1 to 5, inclusive.

The above-described apparatus provide positive feeds of the strips 8 and 108 varying in accordance with the accumulation of the compound in the feed throats 14 and 114. They also serve to prevent positively feed of the strips when the compound has accumulated to an extent approaching clogging the feed throats and fouling the feelers. Hence, uniform supply conditions are maintained without interruptions in the operation of the extrusion machines and without clogging. Also a surplus may be maintained at all times. Compound is kept from accumulating to either an extent at which the feelers would be fouled at any time or at which the feed throats would be clogged.

What is claimed is:

1. In an extrusion apparatus including an extrusion cylinder having a feed throat and a stock screw rotated in the cylinder for conveying along the cylinder plastic compound fed to the feed throat, the improved feed-regulating device which comprises a spiked roller for positively engaging a strip of plastic compound being fed to the extrusion cylinder, a ratchet wheel connected rigidly to the spiked roller, a pawl pressed toward the ratchet wheel for stopping rotation of the spiked roller when in engagement with the ratchet wheel, a feeler positioned in the feed throat in the cylinder and

movable by pile-ups of plastic compound in the feed throat, and means responsive to the feeler for preventing engagement between the pawl and the ratchet wheel when there is less than a predetermined pile-up of compound in the opening and permitting engagement therebetween when there is said predetermined pile-up of compound in the opening.

2. In an extrusion apparatus including an extrusion cylinder having a feed throat and a stock screw rotated in the cylinder for conveying along the cylinder plastic compound fed to the feed throat, the improved feed-regulating device which comprises a spiked roller for positively engaging a strip of plastic compound being fed to the extrusion cylinder, a brake ratchet wheel connected rigidly to the spiked roller, a brake pawl pressed toward the brake ratchet wheel for stopping rotation of the spiked roller when in engagement with the ratchet wheel, a feed ratchet wheel connected rigidly to the spiked roller, a feed pawl pressed toward the feed ratchet wheel, a feeler positioned in the feed throat in the cylinder and movable by pile-ups of plastic compound in the opening, and a cam movable by the feeler between a position holding the brake pawl out of engagement with the brake ratchet wheel and a position holding the feed pawl out of engagement with the feed ratchet wheel.

3. An extruder, which comprises a horizontal extrusion cylinder having a bore and a feed throat extending downwardly to the bore and offset with respect to the axis of the bore, means for feeding a strip of compound into the feed throat, a stock screw for conveying compound from the feed throat into and along the bore, a guide plate fitting into the feed throat and having a lug projecting therefrom toward the stock screw, the edge of the lug adjacent to the stock screw being spaced from the stock screw and forming a generally wedge-shaped opening with the stock screw along which compound carried by the stock screw is forced, whereby the compound is forced against the stock screw, a feeler shoe fitting between the lug and a wall of the feed throat and having sharp edges for engaging walls of the notch, and means mounting the feeler shoe for movement along the lug and responsive to movement of the shoe by compound accumulated in the notch for regulating the strip-feeding means.

4. An extruder, which comprises an extrusion cylinder extending horizontally and having a bore and a feed throat extending downwardly to the bore and offset with respect to the axis of the bore, the cylinder being provided with a notch in one side of the feed throat and extending along the feed throat, means for feeding a strip of compound into the feed throat, a stock screw for conveying compound from the feed throat past the notch into and along the bore, a feeler shoe fitting into the notch and having sharp edges for engaging walls of the notch and movable by compound accumulating between the shoe and the notch, means mounting the feeler shoe for movement along the notch and responsive to movement of the shoe by compound accumulated in the notch for regulating the strip-feeding means, and a wedge carried by the shoe for pushing out of the notch compound accumulating on the shoe.

5. An extruder, which comprises an extrusion cylinder extending horizontally and having a bore and a feed throat extending downwardly to the bore and offset with respect to the axis of the bore, means for feeding a strip of compound into the feed throat, a stock screw for conveying compound from the feed throat into and along the bore, a feeler shoe movable along adjacent walls of the feed throat and having sharp edges for engaging said walls, a generally reciprocable rod mounting the feeler shoe for movement along the feed throat and responsive to movement of the shoe by compound accumulated in the notch for regulating the strip-feeding means, and a compound clearer carried by the rod provided with a wedge for pushing compound in one direction and a second wedge for pushing compound off the shoe, said compound-clearer serving to push compound around the rod and off the shoe to prevent fouling the rod and shoe.

6. An extruder, which comprises an extrusion cylinder having a bore extending therealong from an entrance end thereof to a delivery end thereof and also provided with a feed throat extending into the bore generally transversely to the axis of the bore near the entrance end of the bore, means for feeding a strip of compound into the portion of the feed throat spaced from the side thereof nearest the delivery end of the bore, a stock screw for engaging a strip of compound fed into the feed throat by the strip-feeding means and conveying it into the bore and into a pile in the portion of the feed throat nearer the delivery end of the bore, a feeler shoe mounted for movement along the feed throat in the portion thereof nearer the delivery end of the bore, said shoe having sharp edges for scraping walls of the feed throat, a spring pressed arm secured to the shoe and spaced from said walls of the feed throat for urging the feeler shoe against compound piled up in said portion of the bore, a wedge for forcing compound from between one side of the arm and the wall of the feed throat adjacent thereto, and means responsive to movement of the arm for regulating the strip-feeding means.

7. An extruder, which comprises an extrusion cylinder having a bore extending therealong from an entrance end thereof to a delivery end thereof and also provided with a feed throat extending generally transversely to the axis of the bore near the entrance end of the bore, means for feeding a strip of compound into the portion of the feed throat spaced from the side thereof nearest the delivery end of the bore, a stock screw for engaging a strip of compound fed into the feed throat by the strip-feeding means and conveying it into the bore and into a pile in the portion of the feed throat nearer the delivery end of the bore, a feeler mounted for movement along the feed throat in the portion thereof nearer the delivery end of the bore, means for urging the feeler against compound piled up in said portion of the bore, means responsive to movement of the feeler for regulating the strip-feeding means, and a wedge positioned adjacent to the feeler for pushing compound from between the sides of the feeler and the wall of the feed throat to prevent fouling therebetween.

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