

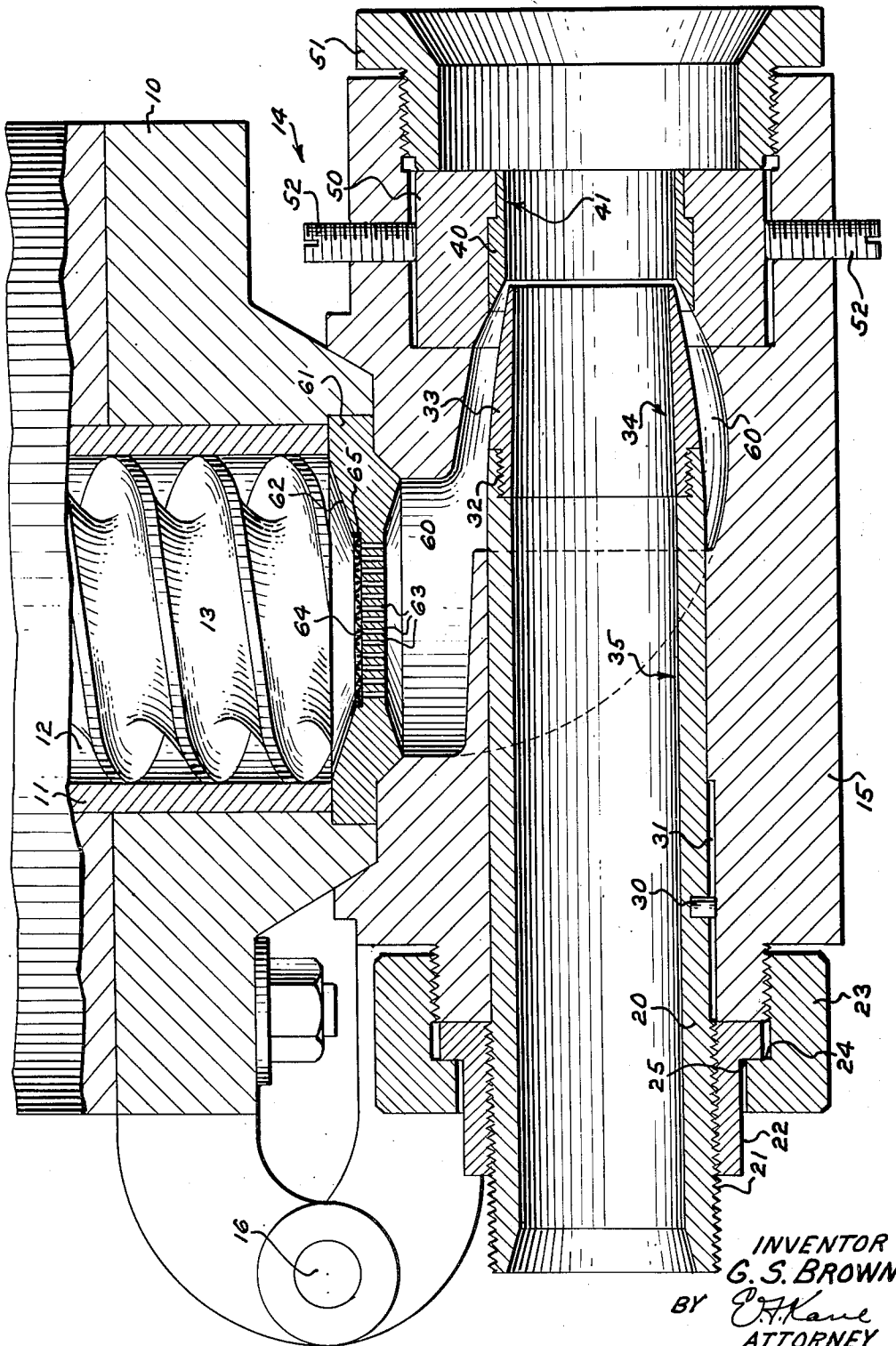
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EXTRUSION APPARATUS

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EXTRUSION APPARATUS

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This invention relates to extruding apparatus and more particularly to apparatus for plasticizing and straining plastic material.

In the manufacture of electrically conducting cables and the like wherein it is desired to cover a core consisting of one or more cable conductors with a protective or insulating cover of thermoplastic material by extrusion, it is necessary that the thermoplastic material be worked prior to the extrusion. It is further necessary that the extrudable material be maintained at all times free of air bubbles in order to prevent blisters or other undesirable flaws in the finished covering. It is known in the art to provide a feed screw for simultaneously working and feeding such thermoplastic material into an extruding cavity. It is further known to provide a breaker plate between the feed screw and the extruding cavity. The ordinary breaker plate is preceded by one or more mesh screens and the combined function of the breaker plate and screens is to restrict the flow of the worked plastic material to such an extent that a back pressure is set up in the material being worked and fed by the feed screw. This back pressure is controlled by the number of screens employed and by the mesh of the screens, and the function of the breaker plate is primarily to support the screen or screens. Back pressure is highly desirable with most plastic materials used for extruding, since such pressure tends not only to drive out undesirable entrapped air or other gases, but also tends to increase the temperature of the plastic material to a certain extent, thereby affording more efficient and easier extrusion thereof.

As has been explained before, the breaker plates now in use in plastic extrusion apparatus are employed primarily to support relatively fine mesh screens, which screens actually provide the necessary back pressure. The breaker plates thus employed are provided with a large number of holes of relatively large diameter. For example, in the ordinary breaker plate used with a feed screw working in a cylinder bore having a diameter of 10", the total area of the breaker plate holes is on the order of 35 square inches. Due to the high fluidity of many plastic materials, the number of screens necessary with conventional breaker plates becomes quite large, making their use undesirable or impossible.

It is an object of this invention to provide an improved breaker plate which may be employed to produce the desired back pressure in extrudable plastic material.

One embodiment of the invention may comprise a breaker plate so constructed that it provides

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not only for adequate back pressure, but also for the necessary streamlining of flow which must be maintained in order to preserve the quality of the plastic material as well as the efficiency of the equipment. A breaker plate embodying these desirable features may comprise a plate having a perforated central area surrounded by a dished imperforate area. It is significant that the total cross-sectional area of the holes in the perforated area is on the order of 1½ square inches in a breaker plate used with a cylinder of 10" diameter. It is thus obvious that the reduced area of the holes greatly improves the back pressure, regardless of whether or not a screen or screens precede the holes. In order to increase the back pressure even further, the dished imperforate annular portion is provided, which not only produces increased back pressure, but also insures smooth flow of the plastic material through the breaker plate by virtue of its dished configuration.

Other objects and advantages of the invention will appear from a consideration of the following detailed description when taken in conjunction with the accompanying single figure drawing illustrating one embodiment of the invention.

Referring to the drawing, the extruding mechanism consists of a cylinder 10 having a cylindrical liner 11 suitably positioned therein to provide a bore 12 into which extrudable plastic material may be fed by any suitable means (not shown). The diameter of the bore 12 is substantially equal to the major diameter of the threads on a feed screw 13 which is rotatably mounted within the bore 12 to work the plastic material and feed it into an extruding head 14.

The extruding head 14 consists of a housing 15 which is suitably hinged to the cylinder 10 by a hinge 16. The housing 15 on the extruding head 14 has a centrally located bore extending therethrough, which serves to position a cylindrical core tube holder 20. The core tube holder 20 is suitably threaded on its outer (left) end 21 to receive an adjusting nut 22, which serves to position the core tube holder 20 longitudinally within the bore formed in the housing 15. The adjusting nut 22 is adapted to be locked in position by a locking nut 23 having an inwardly extending annular shoulder 24 formed thereon, which shoulder is adapted to engage an outwardly extending annular shoulder 25 on the adjusting nut 22. The locking nut 23 is suitably threaded so that it threadedly engages cooperating threads formed on the housing 15, whereby tightening of the locking nut 23 causes the adjusting nut 22 to be firmly seated against the housing 15 and thereby prevent axial movement

of the core tube holder 20. A key 30 which is formed integral with the core tube holder 20 rides in a longitudinal keyway 31 formed in the housing 15, and consequently, rotation of the adjusting nut 22, when the locking nut 23 is released, causes the core tube holder 20 to be moved longitudinally with respect to the housing 15 without relative rotation between the core tube holder 20 and the housing 15.

The core tube holder 20 is interiorly threaded at its inner (right) end with threads 32 which threadedly engage a core tube 33 having a bore 34 in axial alignment with a bore 35 formed in the core tube holder 20. A die 40 having a cylindrical bore 41 is suitably secured in axial relation with the bores 34 and 35 to provide an annular orifice through which extrudable plastic material may flow around a core passing through the bores 34, 35 and 41. The die 40 is adapted to be secured to the housing 15 by means of cooperating annular shoulders formed on the die 40 and on a die holder 50. The die holder 50 is in turn locked in position by means of a locking nut 51 which is threadedly engaged with the housing 15. The die 40 is adapted to be laterally positioned with respect to the core tube by means of a plurality of set screws 52 which are threaded into the housing 15, so that their inner ends bear against the die holder 50.

The annular orifice which is formed by the cooperation of the core tube 33 and the die 40 is in communication with and is adapted to receive plastic extrudable material from a cavity 60 formed within the housing 15. The cavity 60 in turn receives properly worked extrudable plastic material from the feed screw 13. In order to insure that the plastic material being worked by the feed screw 13 is at all times maintained under a sufficient pressure to insure proper plasticity, a breaker plate 61 is suitably secured between the feed screw 13 and the cavity 60. The breaker plate 61 consists of an annular imperforate dished portion 62, which surrounds a circular area provided with a plurality of apertures 63 which serve to permit passage of the plastic material from the feed screw 13 to the cavity 60. The diameter of the circular area which is provided with the apertures 63 is substantially one-half the diameter of the bore 12 and furthermore, the total cross-sectional area of the apertures 63 is on the order of one-fiftieth of the total cross-sectional area of the bore. The proportions just stated have proven highly satisfactory in extruding some polyethylene compounds, but with other compounds which have different consistencies, the area of the apertures may be increased to as much as one twenty-fifth of the total cross-sectional area of the bore. A compound which may be efficiently extruded by use of the last named proportions is polyvinyl chloride. It will be observed that the restriction of flow of plastic material caused by the greatly reduced size of the apertures 63 produces a considerable back pressure within the bore 12. Furthermore, it is to be noted that the dished imperforate area 62 surrounding the apertures 63 not only provides for further back pressure around the feed screw 13, but also, due to its dished configuration, the portion 62 serves to direct the material toward the apertures 63. Smooth flow is thereby provided, and no dead spots are present in which plastic material may become stagnant or clogged.

Although such is not absolutely necessary, it is usually desirable to provide one or more screens 64 over the apertures 63 for the purpose of more

completely straining the plastic material prior to its extrusion. A recess 65 is, therefore, provided within the breaker plate 61 for the purpose of accommodating the screen 64. It is to be observed, however, that such screens 64 used in conjunction with a breaker plate such as that disclosed and described herein have no appreciable effect on the back pressure within the bore 12.

The apparatus disclosed and described herein has been confined to extruding mechanism wherein a cover is continuously extruded on a moving core. It is to be understood that the invention is not limited to the specific apparatus shown herein. The breaker plate construction of this invention may be employed in any type of continuous extrusion apparatus wherein a back pressure within a feeding cylinder is necessary or desirable.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. Apparatus of the character described for providing back pressure within a plastic material feeding and working chamber comprising a breaker plate, an annular imperforate surface on the plate gradually sloping toward its center, and a flat central area on said plate containing a plurality of relatively small apertures, the total cross-sectional area of the apertures being less than about one twenty-fifth of the cross-sectional area of the plate.

2. In a continuous extrusion apparatus including an extrusion cylinder having an extrusion bore therein, an extrusion head and means for forcing plastic material through the extrusion bore to the extrusion head, a working and straining device positioned between the extrusion cylinder and the extrusion head comprising a plate having a perforated area in the center thereof, the diameter of which is substantially one-half the diameter of said bore, and an annular dished imperforate surface surrounding said perforated area, said dished imperforate surface terminating at its juncture with the inner periphery of the extrusion bore, the total cross-sectional area of the perforations being not greater than about one twenty-fifth of the cross-sectional area of the bore.

3. In a continuous extrusion apparatus including an extrusion cylinder having an extrusion bore therein, an extrusion head and means for forcing plastic material through the extrusion bore to the extrusion head, a working and straining device positioned between the extrusion cylinder and the extrusion head comprising a plate having a perforated area in the center thereof, the diameter of which is substantially one-half the diameter of said bore, the total cross-sectional area of the perforations in said perforated area being in the order of one-fiftieth of the total cross-sectional area of said bore, and an annular dished imperforate surface surrounding said perforated area, said dished imperforate surface terminating at its juncture with the inner periphery of said bore.

4. In a continuous extrusion apparatus including an extrusion cylinder having an extrusion bore therein, an extrusion head and means for forcing plastic material through the extrusion bore to the extrusion head, a working and straining device positioned between the extrusion cylinder

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der and the extrusion head comprising a plate having a perforated area in the center thereof, the diameter of which is substantially one-half the diameter of said bore, the total cross-sectional area of the perforations in said perforated area being between one-twenty-fifth and one-fiftieth the total cross-sectional area of said bore, and an annular dished imperforate surface surrounding said perforated area, said dished imperforate surface terminating at its juncture with the inner periphery of said bore.

5. A continuous extrusion apparatus for extruding polyethylene, which comprises an extrusion cylinder having an extrusion bore of predetermined cross-sectional area therein, an extrusion head secured to the extrusion cylinder, means for forcing polyethylene material from the extrusion bore into the extrusion head, and a breaker plate having a perforated area in the central portion thereof and a dished imperforate surface surrounding the perforated area extending from the periphery of the bore to the perforated area, the total cross-sectional area of the perforations in the perforated area being in the order of one-fiftieth of the total cross-sectional area of the bore.

6. A continuous extrusion apparatus for extruding polyvinyl chloride plastic material, which

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comprises an extrusion cylinder having an extrusion bore therein of a predetermined cross-sectional area, an extrusion head, means for forcing polyvinyl chloride material through the extrusion bore and the extrusion head, a breaker plate positioned near the juncture of the extrusion cylinder and the extrusion head having a perforated area in the center thereof and being imperforate in the other portions thereof, the total cross-sectional area of the perforations in the perforated area being between one twenty-fifth and one-fiftieth of the total cross-sectional area of the bore, said breaker plate being provided with sloping surfaces on the forward face thereof from the periphery thereof to the perforated area.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,022,895	Morrell	Dec. 3, 1935
2,090,404	Parkhurst	Aug. 17, 1937
2,135,325	Burt et al.	Nov. 1, 1938
2,262,989	Conklin et al.	Nov. 18, 1941
2,331,139	Safford	Oct. 5, 1943