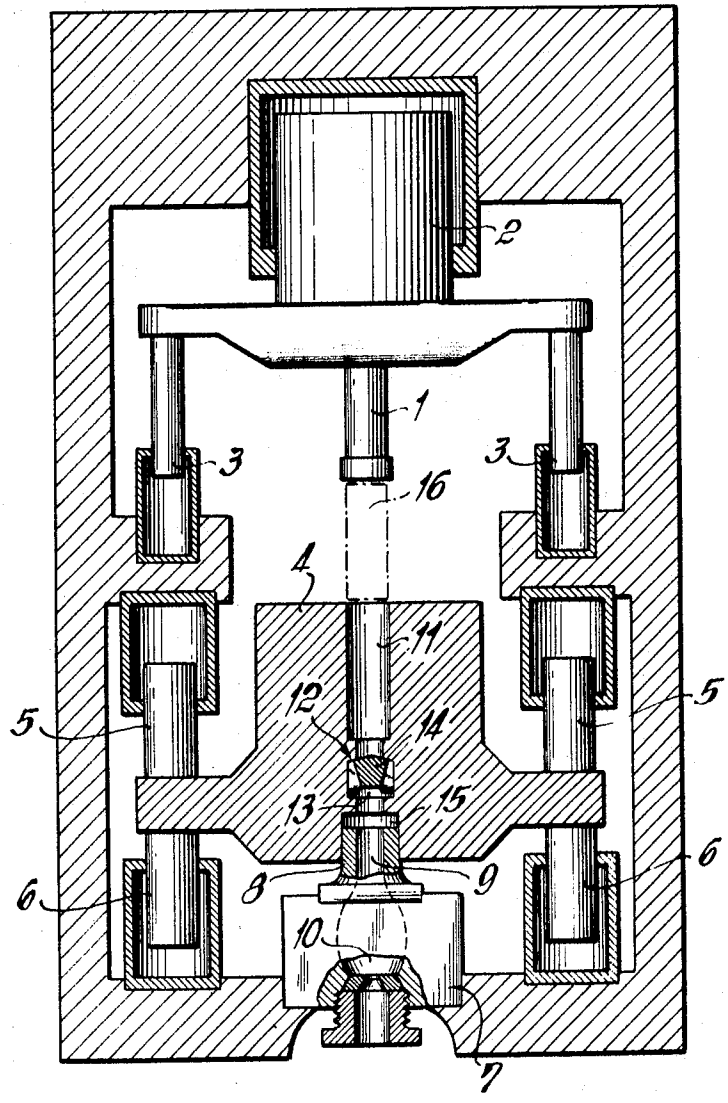
Dec. 7, 1971 H. RIEMANN 3,625,045

CONTINUOUS EXTRUDER HAVING A RECHARGEABLE RECEIVER WITH CONTROLLED MOVEMENT

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FIG. 1



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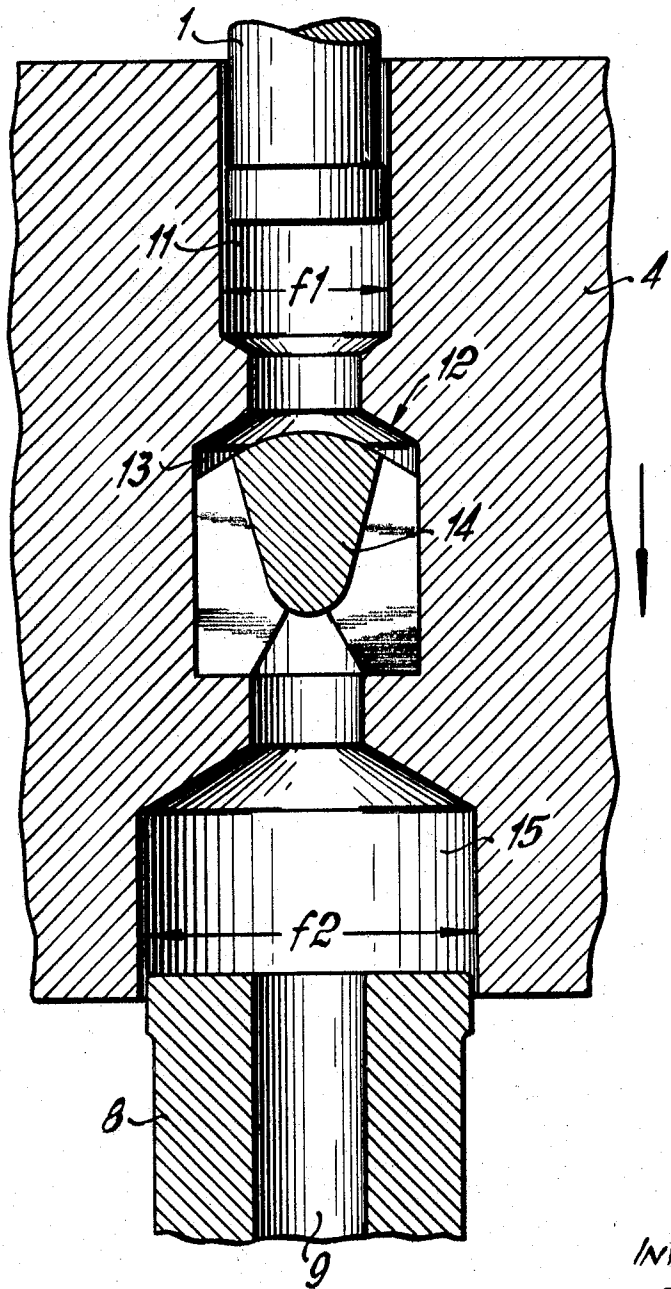
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FIG. 2

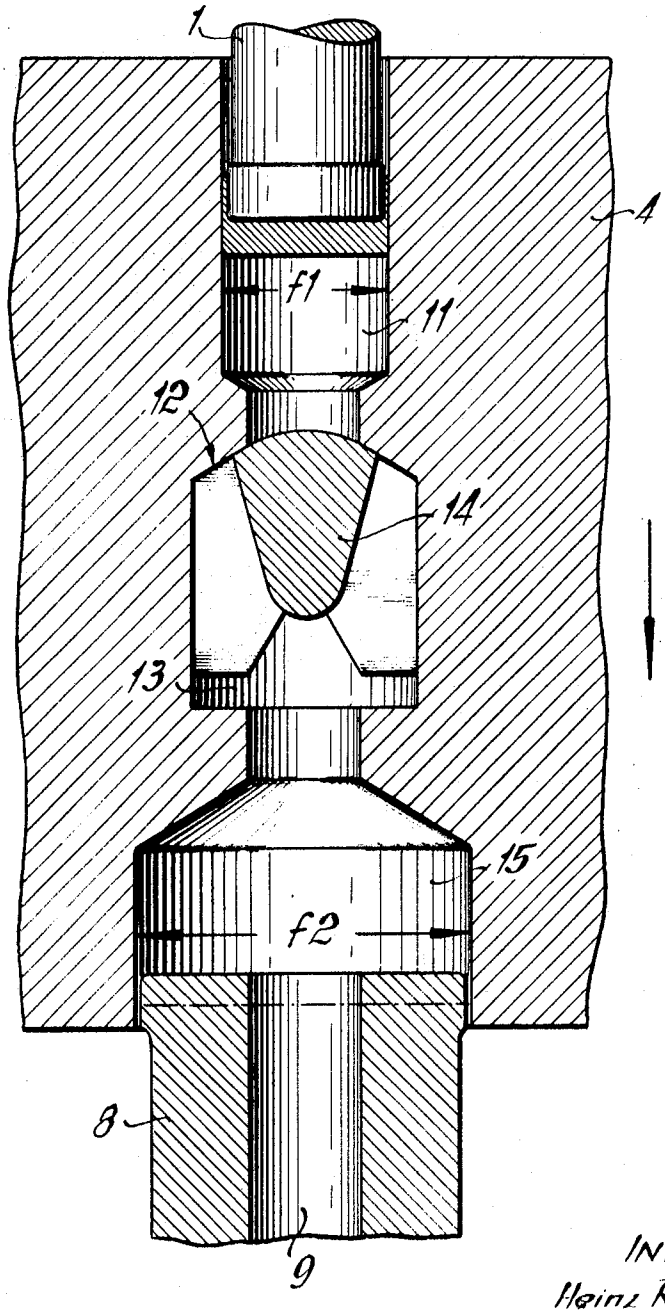


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FIG. 2a



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United States Patent Office 3,625,045 Patented Dec. 7, 1971

3,625,045

CONTINUOUS EXTRUDER HAVING A RECHARGEABLE RECEIVER WITH CONTROLLED MOVEMENT

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Filed July 9, 1969, Ser. No. 840,170
Int. Cl. B21c 33/00
U.S. Cl. 72—270 2 Claims

ABSTRACT OF THE DISCLOSURE

A continuous extruder includes a main press die, a rechargeable receiver having a receiving chamber which can be shut off from a coaxially arranged feed line for the material to be extruded leading to a press chamber of a press head, a storage cylinder formed in the receiver, and an auxiliary apertured press die displaceably guided in the cylinder and connected to the press head. The storage cylinder is rechargeable by movement of the receiver relative to the press head, and takes over the extrusion during recharging of the shut off receiver chamber. The storage cylinder has a cross section larger than that of the receiver chamber, and the receiver is movable, under control in the extruding direction, during shutting off of the receiver chamber and with the press dies stationary, the controlled movement being independent of the designed output velocity of the extrusion. A valve is movable in the feed line to shut off the receiver chamber.

BACKGROUND OF THE INVENTION

A known continuous extruder includes a main press die and a rechargeable receiver having a receiver chamber which can be shut off, by a valve, for a coaxially arranged feed line for the material to be extruded and which leads to the press chamber of a press head or tool holder. The receiver has a coaxial storage cylinder formed therein, and an apertured auxiliary press die is arranged in the storage cylinder and connected with the press head. The storage chamber of the storage cylinder and the auxiliary press die can be charged and recharged by displacing the receiver relative to the press head. The storage cylinder and the auxiliary press die take over extrusion during recharging of the then shut off receiver. The straight coaxial feed line for the material to be extruded is thus, in effect, telescopic at one point.

The material to be extruded is inserted into the receiver chamber, constituting the main displacement chamber, and is extruded by means of the main press die, with the exception of a small residual amount. The material flows around the open valve before it arrives in the press chamber. A small portion of the material passing through the valve chamber is stored in the storage, or auxiliary displacement, chamber.

After the above-mentioned main extrusion procedure, the storage chamber takes over the extrusion. A part of the material is used to close the valve against the then retracting main press die. During this phase of the extrusion, the receiver chamber is shut off by the automatic valve and is recharged. Due to this alternate extrusion from the main displacement chamber and an auxiliary displacement chamber an extruded product is obtained without interruption, as disclosed in German patent 1,108,164.

However, during the closing movement of the valve, the extrusion velocity of the product decreases. This reduction of the extrusion velocity is due to the fact that a part of the material to be extruded is pushed back into the receiver chamber during the closing movement of the valve. The outlet velocity of the extruded product then drops to the extent that the surface pressure thereon diminishes with respect to the closing pressure of the valve.

SUMMARY OF THE INVENTION

This invention relates to continuous extrusion and, more particularly, to a novel and improved continuous extruder in which the outlet velocity of the extruded product remains constant, independent of the prevailing surface pressure.

The objective of the present invention is to obtain an absolutely uniform outlet velocity of the product, independent of the closing pressure of the valve shutting off the receiver chamber. In accordance with the invention, the receiver is formed with a storage chamber which has a cross section larger than that of the receiver chamber. The receiver can be moved, under control, in the extrusion direction during the closing movement of the valve, and with the main and auxiliary press dies remaining stationary, the movement being independent of the designed outlet velocity of the extruded product.

An object of the invention is to provide an improved continuous extruder.

Another object of the invention is to provide such a continuous extruder in which the outlet velocity of the extruded product remains constant independent of the prevailing surface pressure.

A further object of the invention is to provide such a continuous extruder in which there is an absolutely uniform outlet velocity of the product independent of the closing pressure of a valve shutting off a receiver chamber.

Another object of the invention is to provide such a continuous extruder in which the receiver is formed with a storage chamber having a cross section larger than that of the receiver chamber.

A further object of the invention is to provide such a continuous extruder in which the receiver can be moved under control in the extrusion direction during closing movement of the valve, with the main and auxiliary press dies remaining stationary and independent of the designed outlet velocity of the extruded product.

For an understanding of the principles of the invention, reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a somewhat schematic axial sectional view illustrating the construction of a continuous extruder embodying the invention; and

FIGS. 2 and 2*a* are sectional views, to a scale larger than that of FIG. 1, illustrating a detail of the displacement chambers of the receiver, with FIG. 2 illustrating a valve chamber in the open position and FIG. 2*a* illustrating the valve chamber in the closed position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, the continuous extruder essentially comprises a main press die **1**, a press drive **2** and a press return **3**. The extruder further includes a receiver **4**, a receiver drive **5** and a receiver return **6**. The remaining parts include a press head **7** and an apertured auxiliary press die **8**.

Press head **7** is stationary and is connected with apertured auxiliary press die **8**. The aperture or bore of die **8** is indicated at **9**, and a press chamber in press head **7**, communicating with bore **9**, is nidicated at **10**.

Receiver **4** is formed with a receiver chamber, or main displacement chamber, **11** having a valve seat **12** at one

end. A valve chamber **13** communicates with valve seat **12** and has arranged therein an axially movable valve **14**.

A storage cylinder **15**, including a storage chamber acting as an auxiliary displacement chamber, is formed in receiver **4**, namely at the other open end of receiver **4**. Apertured auxiliary press die **8** extends in guided relation into storage cylinder **15**. Storage cylinder **15** is movable relative to auxiliary press die **8**.

The preferably block-shaped material to be extruded is illustrated at **16**. The coaxially arranged feed line for the material **16** starts behind receiver chamber **11**, and can be shut off by means of valve **14**. The feed line terminates in front of press chamber **10**. The chambers of the feed line for the material to be extruded, arranged between receiver chamber **4** and storage chamber **15** and including chambers **11** and **15**, are arranged coaxially. As will be noted by reference to FIG. 2, the cross section f1 of receiving chamber **11** is smaller than the cross section f2 of storage chamber **15**.

The manner of operation of the continuous extruder for block-shaped material will now be described. Receiver **4** is just in advance of the lower end position, and valve **14** shuts off receiver chamber **11**. A new charge of material **16** is inserted into receiver chamber **11** and then, with receiver **4** in the end position, the extrusion operation is started by means of the main press die **1** which is moved downwardly by the drive means **2**.

Due to the overpressure on valve **14** on the side of the die during advance of main press die **1**, valve **14** opens and the material, which has become fluid in the meantime, flows out of receiver chamber **11**, around valve body **14**, through valve chamber **15** and directly to press chamber **10**.

Toward the end of the stroke of main press die **1**, receiver **4** is moved counter to main press die **1**. Thereby, its absolute stroke is diminished, and, by virtue of this movement of receiver **4**, storage chamber **15** increases in volume to the volume necessary for storage.

Receiver **4** reaches the top end position with valve **14** still open, as illustrated in FIG. 2. Shortly thereafter, main press die **1** reaches its bottom end position and stops. Receiver chamber **11** contains a residual amount of the material to be extruded. Valve chamber **13**, storage chamber **15** and bore or passage **9** of auxiliary press die **8**, as well as press chamber **10**, are filled with the material to be extruded.

At this time, receiver **4** is moved in the extruding direction, as indicated by the arrow of FIG. 2*a*. Due to pressure on the side of valve **14** towards storage chamber **15**, valve **14** moves in a closing direction and thus in a direction opposite to the extruding direction. During closing movement of valve **14**, a part of the material is forced back from storage chamber **15** into receiver chamber **11**, because of the simultaneously moving receiver **4** and the different cross sectional areas of receiver chamber **11** and storage chamber **15**. Main press die **1** remains stationary at this time, and auxiliary press die **8** also remains stationary, this latter press die being fixed against movement. The difference in the relative displacements of receiver chamber **11** and storage chamber **15** are illustrated by the dash-dot line in FIG. 2*a*.

The remaining amount of the material, which results from the difference between the area f2 and the area f1, flows through auxiliary press die **8** into press chamber **10**. By corresponding control of the velocity of movement of receiver **4**, which is effected in dependence on the volume and also in dependence on the given outlet velocity of the extruded product, the outlet velocity of the extruded product is maintained constant during closing movement of valve **14** and independent of the prevailing surface pressure.

After valve **14** has shut off receiver chamber **11**, storage chamber **15** takes over the extrusion, receiver **4** being moved further in the extruding direction and relative to the stationary auxiliary press die **8**, until it has reached its end position. In this phase, the closed receiver chamber **11** is recharged and the cycle is restarted.

What is claimed is:

1. In a continuous extruder including a main press die, a rechargeable receiver having a receiver chamber which can be shut off from a coaxially arranged feed line for the material to be extruded, and which leads to a press chamber of a press head, a storage cylinder formed in the receiver, and an auxiliary apertured press die guided in the cylinder and connected to the press head, the storage cylinder being chargeable and rechargeable by movement of the receiver relative to the press head and taking over the extrusion during recharging of the shut off receiver chamber: the improvement comprising, in combination, said storage cylinder having a cross section larger than that of said receiver chamber; said receiver being movable under control in the extruding direction during shutting off of said receiver chamber and with said press dies stationary, independently of the designed output velocity of the extrusion.

2. In a continuous extruder, the improvement claimed in claim **1**, including a valve movable in said feed line to shut off said receiver chamber; said receiver chamber being movable under control in the extruding direction, during closing movement of said valve and with said press dies stationary, independently of the designed output velocity of the extrusion.

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