Feb. 28, 1950 L. E. GAENZLE 2,498,670

EXTRUSION DEVICE

Filed June 28, 1947 3 Sheets-Sheet 1

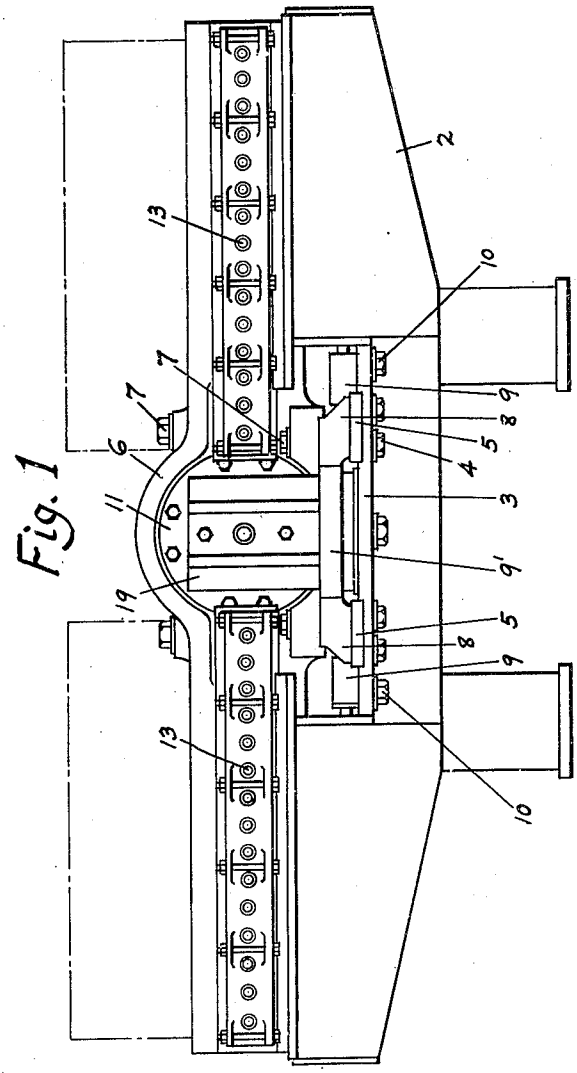


Fig. 1

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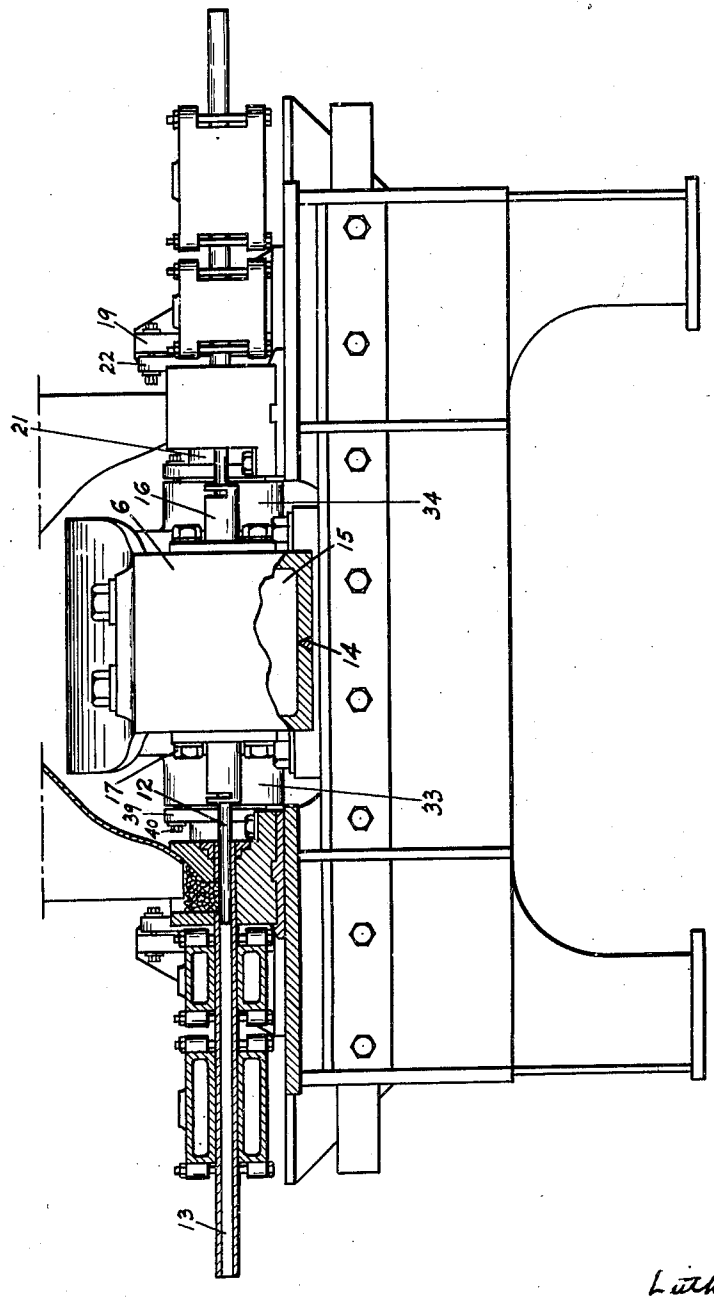


Fig. 2

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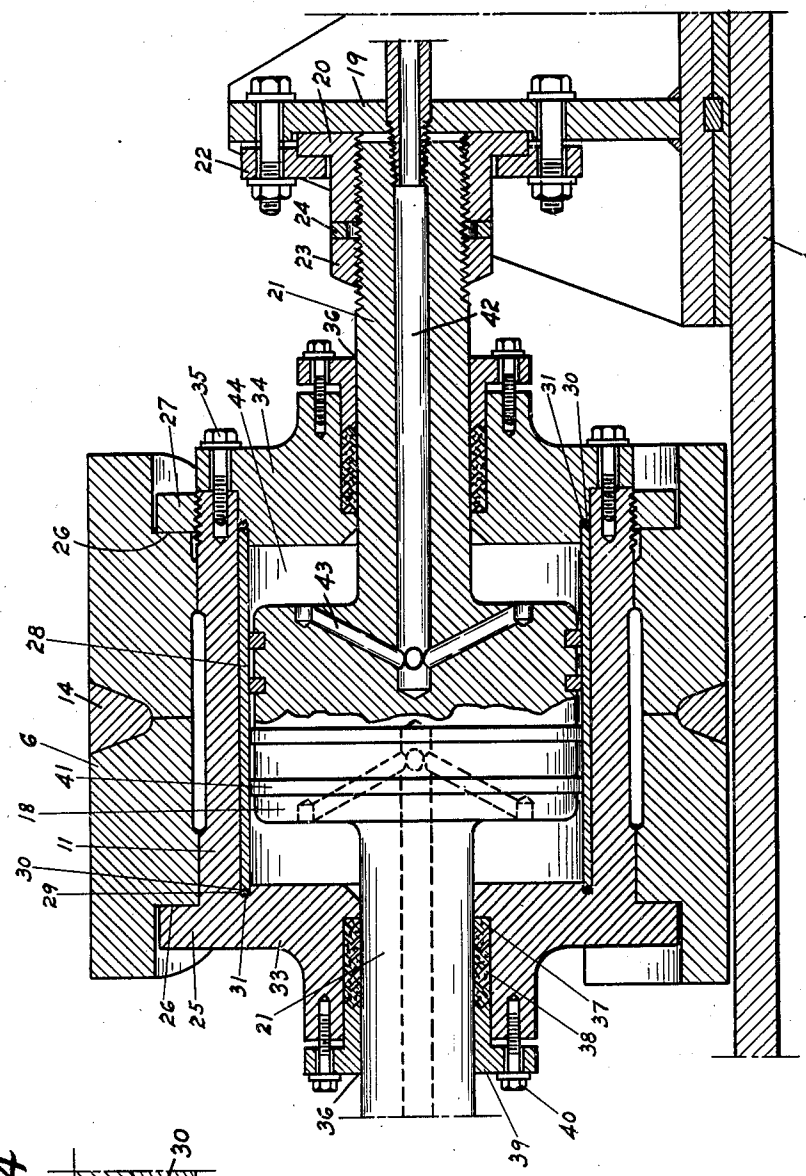


Fig. 3

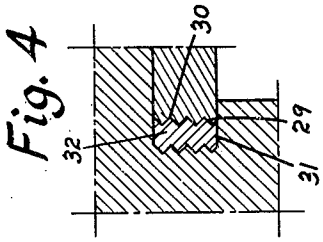


Fig. 4

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UNITED STATES PATENT OFFICE

2,498,670

EXTRUSION DEVICE

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Application June 28, 1947, Serial No. 757,808

6 Claims. (Cl. 18—12)

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This invention relates to an extrusion device and, more particularly, to a device for extruding rods of cork composition or similar material.

In the manufacture of cork composition rods by the extrusion process, it has been common practice to employ a double action extrusion apparatus having two banks of extrusion dies. These banks of dies are arranged in a horizontal plane, the one being disposed at an angle of 180° with respect to the other. A mixture of cork and binder is forced through these dies by means of suitable plungers attached to a crosshead. This crosshead is usually in the form of an I-beam located in the center of the machine between the two banks of extrusion dies and on the same horizontal plane as the extrusion dies with its longitudinal horizontal axis perpendicular to the horizontal axis of the plungers. Reciprocating motion is imparted to this crosshead by means of a hydraulic cylinder or other power-applying means located below the crosshead and attached thereto by suitable linkage. As the crosshead is moved to one side, the plungers attached to that side are forced into the extrusion tubes causing the cork and binder disposed therein to be compressed in the tubes and extruded therefrom in the form of rods of cork composition. During this operation, the plungers operating in the dies on the other side of the machine are withdrawn to a position back of the point at which the cork and binder is fed into the extrusion die. The operation is then reversed, the crosshead moving to the other side of the machine, and the plungers attached to that side compress the composition in the extrusion dies while the plungers are withdrawn to permit recharging of the tubes on the first side of the machine.

While machines of this type have been in use for several years, they have several disadvantages which have never been overcome until the development of the present invention. One of the chief sources of trouble in the old-type apparatus is the power-applying means which is positioned below the crosshead. This power-applying means operates in a plane parallel to the plane of the direction of travel of the crosshead and plungers but is on a plane substantially below the crosshead. Since the power-applying means is not on the center line of the plungers, it causes unequal stresses at the point where the cork load enters the extrusion tubes. These unequal stresses cause the plungers to score the walls of the extrusion tubes necessitating frequent replacement of the extrusion tubes.

The disadvantages inherent in the extrusion

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machine above described have been overcome by altering the method of operation of the power-applying means and also by placing the power-applying means on the same horizontal plane as the center line of the plungers and the extrusion tubes.

An object of this invention is to provide an extrusion machine capable of extruding cork composition rods of a substantially uniform consistency.

Another object of this invention is to provide an extrusion machine in which the power-applying means for operating the crosshead is positioned in the same horizontal plane as the extrusion tubes and plungers.

A still further object of this invention is to provide an extrusion machine which is capable of easy assembly and disassembly for purposes of performing maintenance work, etc.

In order that my invention may be more readily understood, it will be described in connection with the attached drawings, in which

Figure 1 is a front elevational view of an extrusion machine, with parts removed, showing the relative position of the cylinder and extrusion tubes;

Figure 2 is an end elevational view of an extrusion machine, partially in section;

Figure 3 is a longitudinal cross-sectional view of the hydraulic cylinder showing the piston partially in cross section and partially in elevation; and

Figure 4 is an enlarged cross-sectional view showing the ring gasket disposed between the cylinder wall and the removable cylinder insert.

Referring to Figure 1, there is shown a table 2 having a platform 3 to which are secured by means of studs 4 two bronze bearing bars 5. Positioned above the table 2 and centered thereover is a crosshead 6 secured by means of studs 7 to slides 8 and held in proper alignment on the bearing bars 5 by means of guides 9 secured by studs 10 to platform 3. The slides 9 are connected together by cross arms 9'. Positioned centrally in the crosshead 6 is a cylinder 11. On either side of the cylinder 11 and attached to the crosshead 6 are the plungers 12 which operate in the extrusion tubes 13, as shown in Figure 2. In the particular embodiment illustrated, there are fifteen extrusion tubes on each side of the cylinder in each bank, making a total of sixty extrusion tubes on the machine.

The crosshead 6 is preferably cast in two longitudinal halves and welded together, forming a composite crosshead. The purpose of casting the

crosshead in this manner is to provide two sections which can be welded together, thus forming a hollow crosshead member which is considerably lighter in weight than a solid casting. This weld is shown at 14 in Figures 2 and 3. The routed areas of the crosshead are shown at 15 in Figure 2.

The plungers 12 are secured in adapters 16 which in turn are secured by means of studs 17 to the crosshead 6.

Referring to Figure 3, there is shown a cross section of the cylinder 11 illustrating a fixed piston 18. The piston 18 and its shaft 21 are forged as an integral unit. This piston 18 is held in stationary position by upright brackets 19 secured to the platform 3. A sleeve 20 which is threadedly secured to the shaft 21 of the piston 18 fits into a recess in the brackets 19. A retainer 22 fits over the flange 20 and prevents the entire piston assembly from turning in the cylinder. In addition to the threads in the piston shaft 21, the flange 20 is held securely in place by a jamb nut 23, which is also threadedly secured to the shaft 21. A lock washer 24 disposed between the jamb nut 23 and the flange 20 prevents the jamb nut 23 from turning. This assembly holds the piston rigidly in position between the brackets 19.

The cylinder 11 is held in position in the crosshead 6 by means of a flange 25 on one side of the cylinder abutting against a shoulder 26 on the crosshead 6. On the other side of the cylinder, a locking ring 27 is threadedly secured to the cylinder 11 and abuts against the shoulder 26, thus clamping the cylinder firmly between the two shoulders 26 of the crosshead 6. A bronze cylinder liner 28 is provided which is press-fitted into the cylinder 11. This cylinder liner 28 is provided with grooves 29 on its two end edges 30. These scored edges 30 fit into a recess 31 in the cylinder heads. The recess 31 has a scored bottom portion, the scoring of which registers with the scoring on the end of the cylinder liner. A ring gasket 32 is provided between the cylinder liner and the cylinder heads to prevent leakage of hydraulic fluid in this area. This structure is shown in Figure 4. It is highly important that leakage of fluid in this area be prevented for the reason that if a small amount of fluid leaks around the end of the liner, the pressure of the fluid on the outside of the liner will have a crushing effect on the liner and cause the piston to bind to the liner. The cylinder liner 28 is securely held in the cylinder by being abutted against the fixed cylinder head 33. The removable head 34 is then put into place, the cylinder edge 30 fitting into the recess 31 therein, and the removable head is then secured to the cylinder by means of studs 35.

The piston shaft 21 passes through openings 36 in the two cylinder heads. These openings are sealed against leakage of hydraulic fluid by means of a packing ring 37 and chevron packings 38 which are held in place by gland 39 which is secured by means of studs 40 to the cylinder heads 33 and 34.

The piston 18 is provided with piston rings 41 which fit into suitable grooves in the piston. Hydraulic fluid from a suitable source, not shown, is forced in through the passage 42 in piston shaft 21 into the central area of the piston and from this central area, it passes out through radial passages 43 into the cylinder chamber 44.

In making hydraulic cylinders of this type in the past, it has been customary to drill the piston shaft and have the hydraulic fluid line enter the piston shaft at an angle of 90° with respect to the longitudinal axis of the shaft. In a structure of this type, the outlets for the hydraulic fluid to pass from the shaft to the cylinder chamber were placed in the piston shaft directly in front of the piston which provided a weakened area in the piston shaft causing considerable breakage.

This has been overcome by connecting the hydraulic line onto the end of the piston shaft and having the hydraulic passage in the piston running longitudinally thereof into the piston body. This structure does not create any weakened area as was present in previous structures.

In an arrangement of hydraulic fluid passages, such as that disclosed here, the force of the fluid entering the cylinder chamber is directed against the cylinder head, giving a more positive action to the cylinder than the arrangement used previously in which the hydraulic fluid was forced out from the piston shaft into the cylinder chamber at right angles to the direction of travel of the cylinder.

In the operation of this device, hydraulic fluid is forced through the passage 42 in the piston shaft 21 by any suitable means, not shown. The fluid forced through the shaft enters the piston and is forced through the radial passages 43 into the cylinder chamber 44. Inasmuch as the piston is mounted in a fixed position, the fluid in the cylinder chamber 44 forces the cylinder head away from the piston until the chamber is filled with liquid. The cylinder being rigidly fixed to the crosshead 6 carries the crosshead with it which in turn forces the plungers on that side of the crosshead into the extrusion tubes thereby compressing a charge of cork and binder in the tube positioned on that side of the machine. When the cylinder has travelled as far as possible in this direction, the travel of hydraulic fluid is reversed and the fluid is forced into the piston through the passage 42 in the shaft on the other side of the piston. This forces the cylinder in the opposite direction which in turn forces the hydraulic fluid out of the previously filled cylinder chamber through the channels 43 in the piston and the passage 42 to the source of hydraulic fluid.

The cylinder assembly described above is particularly adapted for disassembly for purposes of maintenance by removing the retainer 22 and turning the jamb nut 23 to permit the flange 20 to be moved forward on the piston shaft a distance sufficient to clear the recess in the brackets 10. When the piston has been so disengaged from the brackets 19, the crosshead with the cylinder assembly therein can be removed from the machine. After the crosshead and cylinder assembly have been so removed, the piston may be removed from the cylinder by removing studs 35 which permit the removable cylinder head 34 to be taken off. Removal of the head 34 permits easy access to the cylinder liner 28 for purposes of removal and replacement. In the event it is desired to remove the entire cylinder from the crosshead, this can be readily accomplished by removing the locking ring 27 which has an inside diameter greater than the outside diameter of the removable cylinder head 34 and can be readily removed thereover. After this locking nut has been removed, the entire cylinder assembly can be removed from the crosshead by sliding it laterally outwardly from the

side of the crosshead, opposite the side from which the locking nut has been removed.

It will be readily observed from the above disclosure that I have provided a device which will apply the pressure to the extrusion tubes in a true horizontal direction, thus overcoming the tendency to produce unequal stresses at the point where the work load enters the extrusion tubes. It will also be observed that I have provided a device which can be easily and quickly disassembled for maintenance purposes.

While the above disclosure is directed to a hydraulic cylinder, it will be understood that other power-applying means may be used in carrying out this invention. Furthermore, in the preferred embodiment, the cylinder is located in the crosshead; however, it may be located on either side of the crosshead so long as the center line of the cylinder is on the center line of the extrusion plungers.

While I have illustrated and described a preferred embodiment of my device, it will be understood that the same is not so limited, but may be otherwise embodied and practiced within the scope of the following claims.

I claim:

1. In an apparatus for forming articles by extrusion, the combination of a series of extrusion tubes arranged on a horizontal plane on both sides of the machine, plungers adapted to compress material disposed in said extrusion tubes, said plungers being attached to a crosshead disposed along the horizontal central axis of the machine between said series of tubes, and a hydraulic cylinder positioned in the center of said crosshead, the center line of the cylinder being on the same horizontal plane as the center line of the extrusion plungers.

2. In an apparatus for forming articles by extrusion, the combination of a series of extrusion tubes on a horizontal plane on both sides of the machine, plungers adapted to compress material disposed in said extrusion tubes, said plungers being secured to a cross head disposed along the horizontal central axis of the machine between said series of tubes, said crosshead comprising two longitudinal sections joined by a continuous horizontal weld to form a composite unit, and a cylinder positioned in the center of said crosshead, the center line of the cylinder being on the same horizontal plane as the center line of the extrusion plungers.

3. In an apparatus for forming articles by extrusion, the combination of a series of extrusion tubes arranged on both sides of a machine, plungers adapted to compress material disposed in the extrusion tubes, said plungers being secured to a crosshead disposed along the horizontal central axis of the machine between said series of tubes, a cylinder positioned in the center of said crosshead and rigidly secured thereto, the center line of said cylinder being on the same horizontal plane as the center line of the extrusion plungers, and means for imparting reciprocatory motion to the cylinder to move the crosshead and plungers.

4. In an apparatus for forming articles by extrusion, the combination of a series of extrusion tubes arranged on both sides of a machine, plungers adapted to compress material disposed in the extrusion tubes, said plungers being secured to a crosshead disposed along the horizontal central axis of the machine between said series of tubes, and a cylinder and piston arrangement having its center line on the same horizontal plane as the center line of the plungers attached to said crosshead and capable of imparting reciprocatory motion to said crosshead.

5. In an apparatus for forming articles by extrusion, the combination of a series of extrusion tubes arranged on both sides of a machine, plungers adapted to compress material disposed in the extrusion tubes, said plungers being secured to a crosshead disposed along the horizontal central axis of the machine between said series of tubes, and means for imparting reciprocatory motion to said crosshead, said reciprocatory means being disposed on the same horizontal plane as the center line of the plungers.

6. In a double action extrusion machine, the combination of two series of extrusion tubes arranged on a horizontal plane on both sides of the machine, plungers adapted to compress material disposed in said extrusion tubes, said plungers being attached to a crosshead disposed along the horizontal central axis of the machine between said series of tubes, and a hydraulic cylinder and piston arrangement positioned in the center of said crosshead, the center line of the cylinder being on the same horizontal plane as the center line of the extrusion plungers.

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