Aug. 21, 1956 P. BILLEN 2,759,599

DEVICE FOR REGULATING THE ADVANCE OF THE PRESS RAMS OF EXTRUSION PRESSES

Filed Dec. 30, 1952 2 Sheets-Sheet 1

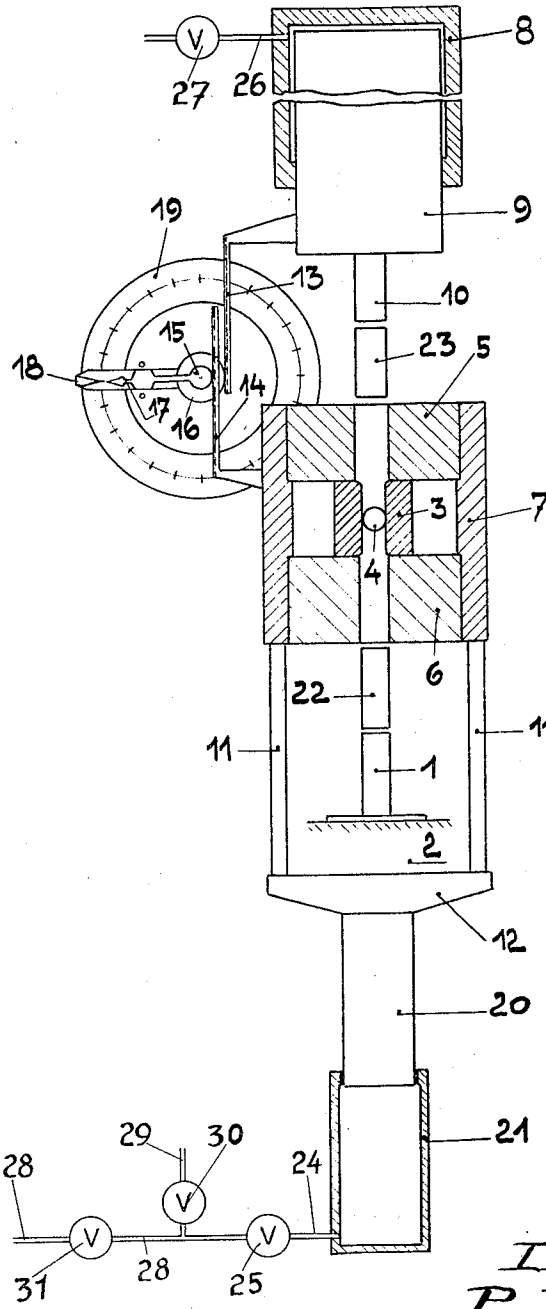


FIG. 1

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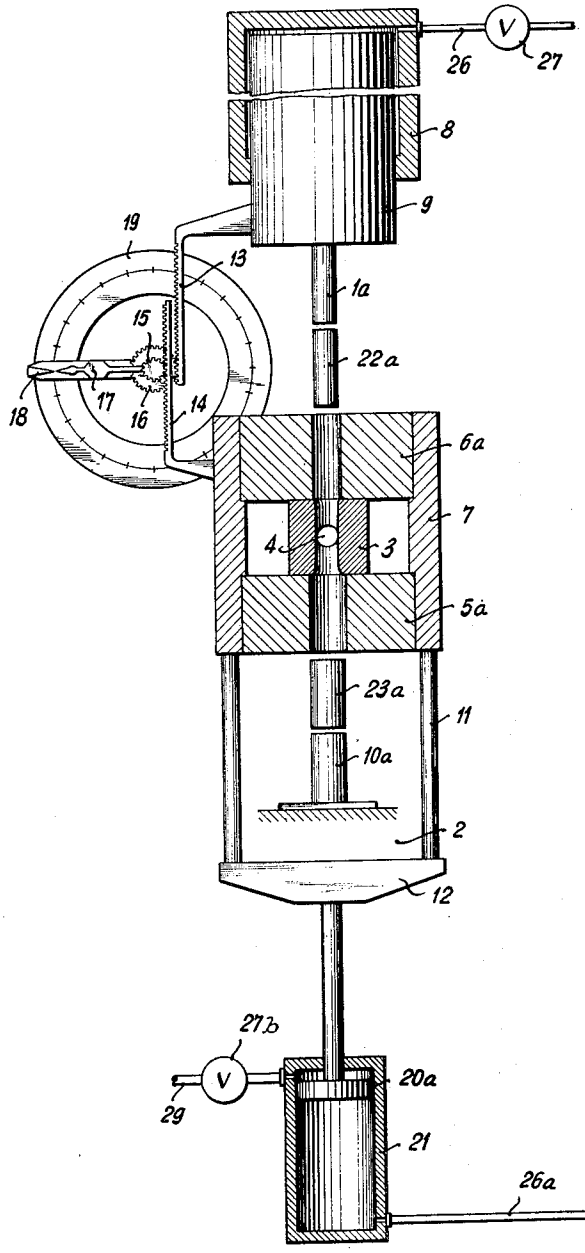


FIG. 2

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2,759,599

DEVICE FOR REGULATING THE ADVANCE OF THE PRESS RAMS OF EXTRUSION PRESSES

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8 Claims. (Cl. 207—9)

The invention deals with the regulation of the advance of the press rams of an extrusion press, and in particular, a cable sheathing press, where the material to be extruded, flowing from two billet or ingot receivers, is forced through the die. A press of this type can be equipped with an auxiliary pressure piston, through the agency of which increased pressure may be exerted on either of the two press rams.

Where the press concerned is one having two receivers of equal bore and feed ducts of equal dimensions leading to the die, the hotter of the two ingots will always flow in advance of and more strongly than the other. Since it is impossible to ascertain in advance which receiver will contain the hotter ingot or billet, it is also impossible to know in which receiver additional pressure has to be exerted in order to achieve the desired uniformity of feed. Ways and means must therefore be provided via the controls to increase the pressure on either one of the two containers according to the circumstances involved. The exercise of such a control system gives rise to certain difficulties, which it is the aim of the invention to obviate.

The invention therefore aims at a device for regulating the advance of the press rams in the respective receivers in such a manner that under all possible working conditions an additional pressure is necessary upon the billet material in only one of the receivers destined from the commencement of operations to receive this pressure.

The invention consists in the fact that the two receivers possess differing cross-sections, rendering it necessary for the auxiliary pressure piston to be effective in only one direction. The fact is that where the containers are of unequal cross-section, the specific pressure exerted on the billet by the ram in the receiver with the smaller cross-section is always higher than that in the one with the larger cross-section. If the difference selected in the cross-sections be large enough, differing degrees in the temperature of the two billets within certain limits can never render necessary increased pressure on the container with the smaller cross-section. It therefore suffices to design the additional controls in such a manner that only the pressure on the container with the larger cross-section is increased or decreased.

This can be so arranged that the auxiliary pressure piston reduces the force being exerted on its associated billet by the ram of smaller cross-section. Additionally, it is also possible to control the auxiliary pressure piston in such a manner that it increases the force exerted on the billet the receiver of larger cross-section by its associated ram. The result remains the same for both cases, apart from the fact that in the first case two forces are subtracted one from the other, and in the second case, are added one to the other, so that adoption of the principle expressed in the latter case results in a somewhat higher degree of economy.

It is best to construct the press on a vertical axis with a movable press ram located at the top and a fixed ram located at the bottom in alignment with the movable ram.

The auxiliary pressure piston also is preferably mounted at the bottom.

The most advantageous billets or ingots to employ are those having equal volume, but varying length. Since, then, an equal volume of material to be extruded is fed to the die from either side, the remainder or unextruded portion of the one ingot or billet is equal in volume to the remainder of the other ingot or billet, this permitting, upon completion of the working stroke, the insertion of additional suitably shaped billets into the respective receivers.

The invention therefore has for one particular object to provide an extrusion press arrangement having oppositely facing billet receivers, a press ram cooperable with each receiver for extruding the material therefrom from opposite directions, means for moving at least one of the rams toward the other and an auxiliary hydraulically actuated piston controllably acting in opposition to the movable ram.

It is a further object of the invention to provide an extrusion press in which oppositely disposed and hydraulically aligned cylinder and piston arrangements effect relative movements between aligned billet receivers and rams on opposite sides of a die whereby material is extruded through the receivers and in which the billet receivers have equal valume but different cross sectional areas and lengths and in which control means are provided to vary the effective pressure exerted on the material in the receiver of smaller cross sectional area so that this variation will ensure uniform volume flow out of both receivers and through the die.

Further and more specific objects will be apparent from the accompanying drawings in which:

Figure 1 is a diagrammatical view partly in elevation and partly in vertical longitudinal section illustrating an arrangement in which the press has a vertical axis, the receiver with the smaller cross sectional area is the lower most one, and

Figure 2 is a similar view illustrating the modification in which the receiver with the smaller cross-section is the upper most one.

In the arrangement of Figure 1 the press includes a stationary press ram 1 extending vertically above a lower most and fixed press platen 2. A housing 7 accommodates the combined receiver and die structure which includes an upper receiver 5, a lower receiver 6 and a die 3 positioned intermediate the receivers and communicating with the bores therethrough. There is a bore 4 extending at right angles to the axis of the bores in the receivers serving for the exit of for example, a cable that has been sheathed in the press. Above the housing 7 and coaxial with the bores through the receivers is a main pressure cylinder 8 slidably mounting a main press piston 9 to which is connected a movable press ram 10. Depending beneath the housing 7 are pillars 11 fixed to a crosshead 12 carrying an auxiliary piston 20. This auxiliary piston is slidable in a cylinder 21. The arrangement is such that the respective cylinders, pistons, rams and billet receivers are axially aligned.

The bore in the receiver 5 has less length but greater cross sectional area than that in the receiver 6. The billets 23 and 22 that are to be inserted into the respective bores are correspondingly shaped and the stationary ram 1 has less diameter and is longer than the movable ram 10. In view of the fact that the ram 1 and the bore in the receiver 6 have less diameter than the bore in the receiver 5 and the ram 10, the specific pressure exerted on billet 22 will be higher than that exerted on billet 23. Therefore, the billet 22 will usually commence to flow before the billet 23 even if the latter is of somewhat higher temperature. This fact is taken advantage of by the present invention. The piston 9 is projected from its

cylinder by fluid under pressure fed thereto through conduit 26 in which is disposed a valve 27 for admitting fluid into cylinder 8 or permitting fluid to leave the cylinder. The piston 9 is returned by actuation of the return piston and cylinder not shown.

The cylinder 21 controllably receives fluid under pressure through a conduit 24 which extends between the cylinder and a throttling valve 25, an additional conduit 28 extending to a control valve 30 and a supply conduit 29 having a control valve 31 therein communicates with the conduit 28. The arrangement is such that with valve 31 closed and valve 29 open and the throttling valve 29 suitably adjusted to wide open position fluid under pressure enters cylinder 21 to lift piston 20 and thus the interconnected receivers and die prior to commencing an extruding operation. By closing valve 30 and opening valve 31 and suitable regulation of the throttling effect of valve 25 the downward motion of piston 20 in cylinder 21 is regulated.

To indicate to the operator in what fashion valve 25 is to be manipulated to vary the movement of piston 20 and thus vary the effect of pressure exerted by ram 1, the invention provides motion responsive indicating means including a rack 13 carried by piston 9 and a rack 14 carried by the housing 7. The racks respectively engage pinions 15 and 16 having different size correlated with the respective receiver diameters in the pinions move indicating hands or pointers 18 and 17 respectively relative to a scale disc 19.

Thus with pressure applied to piston 9 and piston 20 and the discharge from cylinder 21 throttled, the housing 7 and ram 10 move relative to ram 1. The billet entering the receiver bores resists the relative movements. The movements of the rams 1 and 10 relative to the receiver bores is indicated by the pointers 18 and 17. As long as these pointers are in coincidence, that is, occupy the same relative position on rack 19, uniform quantities of materials are being extruded from both receivers. If, for example, the quantity of material flowing from billet 22 is greater than that from billet 23, pointer 17 will move ahead of pointer 18 in a clockwise direction. The operator actuates valve 25 to cause a greater throttling effect. The increased throttling of the discharge of fluid from cylinder 21 retards the downward movement of piston 20 thus increasing the force opposing the downward movement of the receivers 5 and 6. This increased throttling, therefore, absorbs a portion of the force exerted by the main piston 9. Therefore, the force exerted on billet 22 and thus its specific pressure is reduced. This action causes an increase in the flow of billet 23 so that pointer 18 overtakes pointer 17. If the pointers are again in coincidence and remain in that position, that is, one above the other, no further actuation of the throttling valve is necessary. If the pointer 18 moves ahead of pointer 17, the operator actuates the throttling valve to reduce the throttling effect even, if necessary, to opening this valve wide. This reduces the force opposing the downward motion of plunger 10 so that the reaction of piston 20 is partly or completely removed whereby the force acting on billet 22 increases so as to accelerate the flow of this billet until the pointers are again in coincidence.

It is clear that with this arrangement the operator by suitable manipulation of throttle valve 25 can by observing the action of the pointers provide that an equal volume of material is extruded from each receiver.

It is further to be pointed out that in the arrangement in Figure 1 the control of the movement of piston 20 varies the force that opposes the downward movement of piston 9. This variation reduces the force exerted by piston 9 when the discharge from cylinder 21 is further restricted. The arrangement of Figure 2 in which the parts that are the same as in Figure 1 bear the same reference characters is modified to the extent that the receiver with the largest diameter bore is the lower most receiver 5*a* while the upper receiver 6*a* has the smaller bore. The stationary ram 10*a* has larger cross sectional area and is shorter than the movable ram 1*a*. The lower most piston 20*a* is a double faced piston. The conduit 26*a* in which is interposed a valve 27*a* leads fluid beneath piston 20*a* to raise the housing 7 and the receivers to starting position. During extrusion of the billets 22*a*, 23*a* the housing and the piston 20*a* descend. Since the smaller diameter block 22*a* is the upper most block which receives the higher specific pressure, the variation in the relative movements between rams 1*a* and 10*a* is effected by increasing the force exerted by ram 10*a*. To accomplish this the upper face of 20*a* receives fluid under pressure from a conduit 29 under control of a valve 27*b*, the operator actuating valve 27*b* in such fashion as to maintain the pointers 17 and 18 in coincidence on the scale 19. In this case the force applied by piston 9 is augmented by the force applied to the upper face of piston 20*a*.

It will be clear, therefore, that the present invention provides an extrusion press including axially aligned components comprising a material receiver and die structure which includes oppositely facing billet receiving bores and a die intermediate the bores, communicating therewith and having an axis extending at right angles thereto. A first press ram component is in alignment with and cooperable with one receiver bore to extrude a billet and a second press ram component is axially aligned with and cooperable with the other receiver bore. At least one of the components is stationary and means are provided for effecting relative axial movement between the rams and the bores to extrude billet material through the die. The last mentioned means comprise a hydraulical cylinder and piston means operably connected with each of the movable components, both cylinder and piston means are in alignment with the rams and bores and the cylinders are oppositely disposed. The cross sectional area of at least one of the ram and piston on one side of the die is less than the corresponding area of at least one of the ram and piston on the other side of the die. Since the cross sectional area of the rams corresponds to that of the receiver bores, the arrangement results in a higher specific pressure being applicable by one of the rams. Indicating means are provided that are actuated in response to relative movement between the rams and bores which indicate the volume of material flowing out of the respective bores. The indicating means include movable components movable in coincidence as long as the volume of material through both bores is equal. When the flow from one bore or the other is unequal, the indicating components move relative to one another or out of coincidence and control means are provided for varying the movement of one of the pistons only which varies the relative movement between the rams and the bores so as to equalize the volume of material flow through both bores to restore the movable indicating components to coincidence with one another. In Figure 1 the control comprises varying the discharge of the cylinder 21 to a greater or lesser degree so that the resistance of piston 20 acting against piston 9 can be varied with an increase in this opposing force diminishing its specific pressure applied by ram 1*a*.

In Figure 2, the addition of pressure fluid to be active on the upper face of piston 20*a* likewise diminishes the specific pressure applied by ram 1*a* since in this case the smaller ram is at the top.

What we claim is:

1. In an extrusion press, axially aligned components comprising a combined material receiver and die structure component including oppositely facing material receiving bores and a die positioned intermediate the same, communicating therewith and having an axis extending at right angles thereto, a first press ram component in alignment with and cooperable with one bore and a second press ram component in alignment with and cooperable with the other bore, means fixedly mounting at least one of said components, means for effecting relative axial

movement between the other two components to force material through the bores and out of the die structure including oppositely facing hydraulic cylinders and a piston means slidable in each cylinder, one piston being connected to one of said movable components and the other piston being connected to the other of said movable components, said pistons and cylinders being axially aligned with said bores and rams, at least one of the ram or the piston elements on one side of the die having less cross sectional area than the corresponding element on the other side of the die creating a greater effective extruding force caused by the movement of one of said movable components and means for varying the pressure in the cylinder associated with one only of said movable components to equalize the volume of material flowing through the respective bores.

2. In an extrusion press, axially aligned components comprising a combined material receiver and die structure component including oppositely facing material receiving bores and a die positioned intermediate the same, communicating therewith and having an axis extending at right angles thereto, a first press ram component in alignment with and cooperable with one bore and a second press ram component in alignment with and cooperable with the other bore, means fixedly mounting at least one of said components, means for effecting relative axial movement between the other two components to force material through the bores and out of the die structure including oppositely facing hydraulic cylinders and a piston means slidable in each cylinder, one piston being connected to one of said movable components and the other piston being connected to the other of said movable components, said pistons and cylinders being axially aligned with said bores and rams, at least one of the ram or the piston elements on one side of the die having less cross sectional area than the corresponding element on the other side of the die creating a greater effective extruding force caused by the movement of one of said movable components, indicating means actuated in response to relative movement between said rams and bores including movable indicating components and means mounting the same for movement in coincidence as long as the volume of flow through both bores is equal and for relative movement with respect to each other when the volume of flow through the respective bores is unequal and control means for varying the pressure in the cylinder associated with one only of said movable components for equalizing the volume of material flow through the bores when said movable indicating components are out of coincidence.

3. In an extrusion press, axially aligned components comprising a billet receiver and die structure including oppositely facing billet receiving bores and a die positioned intermediate the bores, communicating therewith and having an axis extending transversely thereto, said bores having equal volume but different lengths and cross sectional areas, a first ram component in alignment with one of said bores and having a cross sectional area corresponding thereto, a second ram component in alignment with the other of said bores and having a cross sectional area corresponding thereto, means fixedly mounting one of said ram components, means mounting the said structure for axial movement relative to said fixed ram component, means for moving said second ram component toward said first ram component and relative to said structure to effect extrusion of material through said die structure, means movable in response to relative movements between said rams and bores including indicating components movable in coincidence as long as equal volumes of material are forced through the respective bores and out of the die structure and manually operable control means for varying the axial movement of said structure relative to said stationary ram to restore said indicating components to coincidence when unequal volumes are flowing out of said bores.

4. In an extrusion press, an axially movable billet receiving structure having oppositely directed billet receiving bores, one bore having less cross sectional area than the other and having a length longer than the other bore but having the same volume as the other bore, a fixed ram in alignment with one of said bores and having a cross sectional area corresponding thereto, a movable ram in alignment with the other bore and having a cross sectional area corresponding thereto, a fluid pressure actuated piston in alignment with and cooperable with the movable ram for moving the same toward the fixed ram, whereby billets inserted in said bores are forced therethrough from opposite directions and the movement of said piston imparting axial movement to said structure toward said fixed ram, and means for variably controlling the movement of said structure in the direction toward said fixed ram in relation to the relative movement of said movable ram toward said fixed ram to maintain the volume of material forced through one bore equal to that forced through the other.

5. In an extrusion press, a billet receiving component having oppositely directed billet receiving bores, one bore being longer than and having less cross sectional area than the other, a first ram component axially aligned with one bore and movable therein during extruding, a second ram component axially aligned with the other bore and movable therein during extruding, the said rams having cross sectional areas corresponding to the bores in which they are movable, means fixedly mounting one of said components, means mounting the other two components for axial movement toward said fixed component to effect relative axial movement between said rams and bores, means for applying pressure to both of said movable components to effect extrusion including means applying a higher specific pressure to one component than to the other, and means for varying the pressure exerted by the other component only to equalize the volume of material extruded from both bores.

6. In an extrusion press, an axially movable billet receiver structure having oppositely directed upper and lower vertically positioned billet receiving bores of equal volume and unequal cross sectional areas, a fixed ram in alignment with one bore and having a cross sectional area corresponding thereto, a movable ram in alignment with the other bore and having a cross sectional area corresponding thereto, a first cylinder, a piston therein in alignment with the movable ram, means for admitting fluid behind said piston to move the same and thus the ram toward the upper bore, to apply extruding pressure against a billet in the upper bore and to move the receiver structure towards the fixed ram to apply extruding pressure against a billet in the lower bore, a second cylinder, a second piston in said second cylinder connected to said receiver and mounted in alignment with and beneath said fixed ram, means operably connected with and movable in response to axial movements of said movable ram and said structure respectively toward said fixed ram to indicate the relative volumes of material extruded from each bore, and control means varying the movement of said second piston so as to equalize the volume of material extruded from the respective bores.

7. In a press as claimed in claim 6 and the upper bore having the greater cross sectional area, and the said control means including means variably opposing the force applied by the first piston.

8. In a press as claimed in claim 6 and the lower bore having the greater cross sectional area and said control means including means augmenting the force applied by the first piston.

References Cited in the file of this patent

UNITED STATES PATENTS

Re. 13,562	Summey	May 13, 1913
2,018,217	McNamee	Oct. 22, 1935