Sept. 1, 1936. H. ALBERS 2,052,738

VERTICAL HYDRAULIC TUBE EXTRUSION PRESS

Filed Dec. 1, 1934 2 Sheets-Sheet 1

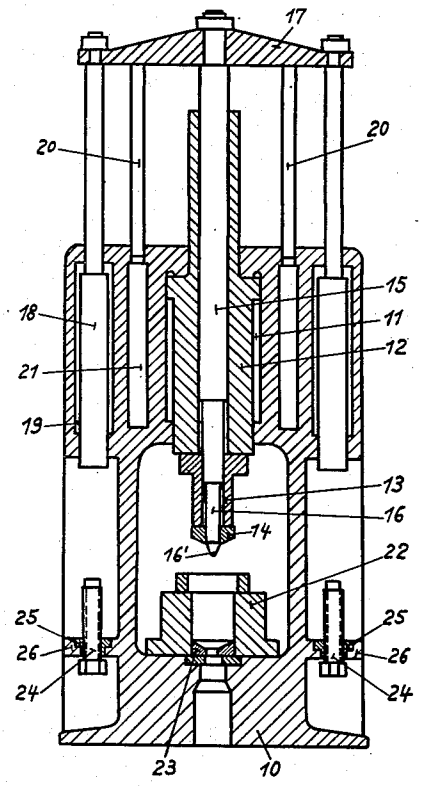


Fig. 1

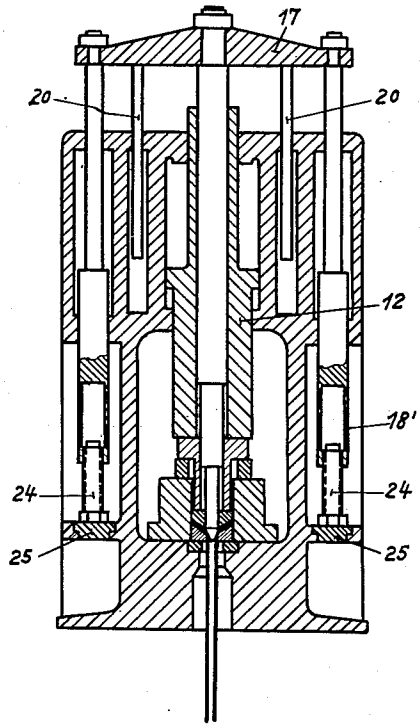


Fig. 2

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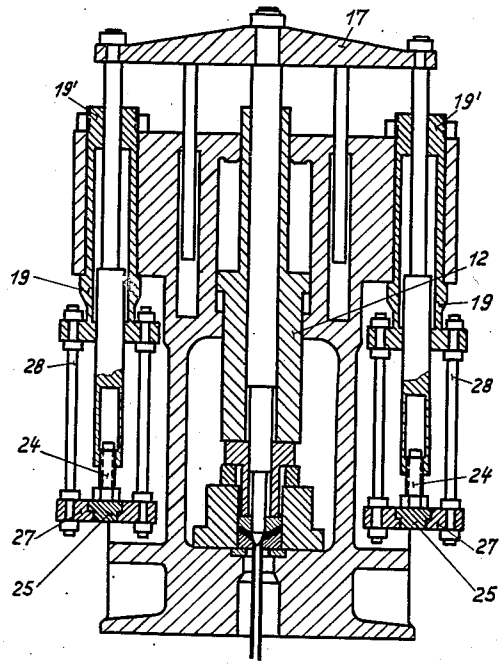


Fig. 3

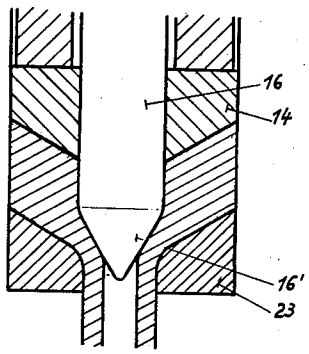


Fig. 4

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VERTICAL HYDRAULIC TUBE EXTRUSION PRESS

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Application December 1, 1934, Serial No. 755,562
In Germany December 11, 1933

2 Claims. (Cl. 207—3)

My invention relates to hydraulic tube extrusion presses of the vertical type. In presses of this kind a mandrel is usually provided which, after piercing a billet is lowered first into the die and then, as extrusion proceeds, beyond said die, the diameter of the mandrel being equal to or at least not greater than the inner diameter of the extruded tubes. With tubes, having a small inner diameter, as stay bolts for instance, the cross section of the mandrel will become so small however, that the mandrel, on piercing the billet, is liable to warp or even to break.

To overcome this drawback, mandrels were provided with conical ends but with a larger diameter than the container of the tube on the shaft portion. In operation, these mandrels after having pierced the billet, were only lowered so far that their conical ends projected into the dies, whereafter the downward stroke of the mandrels was stopped and extrusion started. In this instance, the narrowest annular space which occurred between the conical end of the mandrel and the die determined the wall thickness of the tubes. As said space varied with the position of the mandrel relative to the die, it was necessary to limit exactly the downward stroke of the mandrel which was effected by providing suitable stops on stationary parts of the frame of the press, as the frame for instance, and against which the mandrel advancing mechanism abutted.

In known construction of this type, said stops were generally provided on top of the press frame, that is at a great distance from the floor on which the press was erected so that they were not easy of access or to inspect when adjustment was required. So it was sometimes very difficult to maintain the desired position of the mandrel relative to the die and thereby also the desired dimensions of the tubes. This was particularly the case with such extrusion presses of the vertical type in which the mandrel holder extended all through the main plunger of the press and carried a cross-head at its top to which the piercing plungers, forming the mandrel advancing means, were attached.

It is, therefore, an object of this invention, to provide a vertical hydraulic tube extrusion press of the vertical type in which the stops for limiting the stroke of the mandrel are so located that they are ready of access and easy to be inspected. I attain this object by so arranging the stops on the frame that the bottom ends of the piercing plungers abut against said stops on their downward stroke.

It is a further object of my invention to provide a vertical hydraulic tube extrusion press of this kind on which, when desired, also cylindrical mandrels can be used. I attain this object by giving the stops the form of removable inserts of larger diameter than the piercing plungers so that the latter can freely pass through the apertures left open by the inserts after their removal.

It is a still further object of this invention to provide a vertical hydraulic tube extrusion press in which the stresses exerted by the piercing plungers when abutting against the stops are not transmitted to the press frame. This I attain by providing a connection through which the forces on the stops are directly transmitted back to the upper surface of the piercing plungers without passing through the press frame.

With these and other objects in view, I will now describe my invention more fully in detail, reference being made to the accompanying drawings in which:

Figs. 1, 2 and 3 are sectional side elevations of three different embodiments of a press embodying the invention, Fig. 1 showing the press before and Figs. 2 and 3 after the extrusion of a tube.

Fig. 4 is a more diagrammatic showing of a mandrel having a conical end and of a die of a vertical hydraulic tube extrusion press in that relative position in which the stops according to the invention become operative.

In the drawings, a vertical hydraulic tube extrusion press is shown having a frame 10, in the upper part of which is provided a hydraulic cylinder 11 for a main plunger 12 carrying at its bottom end the press ram 13 provided with disk 14. The plunger 12 has a central bore serving as guide to a holder 15 for a mandrel 16 having a conical end 16'. The holder 15 carries at its top a cross member 17 to which piercing plungers 18, slidable in hydraulic cylinders 19, are attached for effecting the downward stroke of the mandrel 16. Further attached to the cross member 17 are pull-back plungers 20, slidable in hydraulic cylinders 21, for lifting the mandrel. Lifting of the press ram 13 is effected by the main plunger 12 which for this purpose is of the double-acting differential type, it being, of course, understood that any other suitable means may be provided instead. In the base part of frame 10, a billet container 22 is arranged with a die 23 of suitable configuration at its bottom.

All these parts are well-known and present in each of the three embodiments shown in the drawings; their operation is also well-known and need only be briefly described.

After the insertion of a billet into container 22 the piercing plungers 18 are lowered together with the mandrel 16 until the latter has reached the position of Fig. 4, in which the conical end 16' is lowered into the die 23 so far as to define the required annular cross section for the extrusion process. Thereafter the main plunger 12 is lowered with the press ram 13 whereby the disc 14 and the billet is extruded around the conical end of the mandrel so as to form a tube of the desired dimensions.

Now, in order to limit the downward stroke of the mandrel 16 exactly at its desired position, I provide suitable stops in the frame 10 which in the embodiment of Figure 1 are designed in such a way as to form adjustable bolts 24, threaded into inserts 25 in flanges 26 of the press frame 10. The stops 24 are arranged in the path of the piercing plungers 18 so that the bottom ends of the latter will abut against them at the end of their downward stroke. By adjusting the bolts 24 I can vary the final position of the piercing plungers 18 on the end of their downward stroke and thereby also that of mandrel 16 whereby, as will be readily seen from the foregoing, the inner diameter of the tube will be varied accordingly. The bolts 24 for stopping the downward stroke of the piercing plungers 18 are located here only at a short distance from the floor so that they can be easily reached or inspected by the operators of the press. In fact, said stops are disposed substantially in the same plane as the container 22 and close to the latter so that they are as easily accessible as the latter.

In the embodiments of Figs. 2 and 3 the stops for the piercing plungers are formed by the inserts 25, the adjustable bolts 24 being threaded in this case to the bottom ends of the piercing plungers 18 which have hollow extensions 18' for that purpose, the other parts of the press according to these figures being the same as those according to Fig. 1.

In the embodiment according to Fig. 3, the inserts 25 are arranged in cross members 27 instead of the flanges 26, the cross members 27 being connected by means of rods 28 to the cylinders 19 of the piercing plungers which are here separate from the press frame and form a unitary structure together with said rods, said cross members and said stops. By this arrangement, the impact caused by the abutting of the bolts 24 against the inserts 25 at the end of the downward stroke of the piercing plungers 18 is transmitted through the cross members 27 and the rods 28 back to the cylinders 19 and their end walls 19'. With similar forces the pressure medium (water) contained in the cylinders 19 acts from below against said end walls 19', which forces are likewise transmitted by the cylinders 19 to the rods 28 and the parts connected therewith forming a unitary structure which in this manner is subjected to two equally large forces acting in opposite directions and which thus neutralize each other so that the press-frame is not affected by any stresses.

Should it be desired to use a mandrel which can be freely passed through the die 23 without being stopped there, as it is the case with cylindrical mandrels, the inserts 25 are removed so that the piercing plungers 18 can freely pass through the apertures left open by said inserts, the latter having, of course, a greater diameter than the plungers 18 for that purpose.

I claim as my invention:

1. In a vertical hydraulic tube extrusion press, a frame having an upper and a lower portion, a main plunger slidable in the upper portion of said frame, a ram carried by said plunger, a mandrel, a holder for said mandrel extending through said entire plunger and movable independently thereof, a cross-member at the top of said holder disposed above said frame, means attached to said cross-member for downwardly moving said holder and said mandrel, outwardly projecting flanges on the lower portion of said frame provided with apertures, and removable stops extending through the apertures in said flanges in the path of, and in alignment with, said means to limit their downward movement, said stops being of greater diameter than that of said means so as to enable the latter to freely pass through the said apertures upon the withdrawal therefrom of said stops.

2. In a vertical hydraulic tube extrusion press having an upper and a lower portion, a frame, a main plunger slidable in the upper portion of said frame, a ram carried by said plunger, a mandrel, a holder for said mandrel extending through said entire plunger and movable independently thereof, a cross-member at the top of said holder disposed above said frame, plungers attached to said cross-member for downwardly moving said holder and said mandrel and slidable in hydraulic cylinders, the latter being formed separate from said frame, stops in the path of, and in alignment with, said plungers to limit their downward stroke, and a rigid connection between said stops and said cylinders separate from said frame.

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