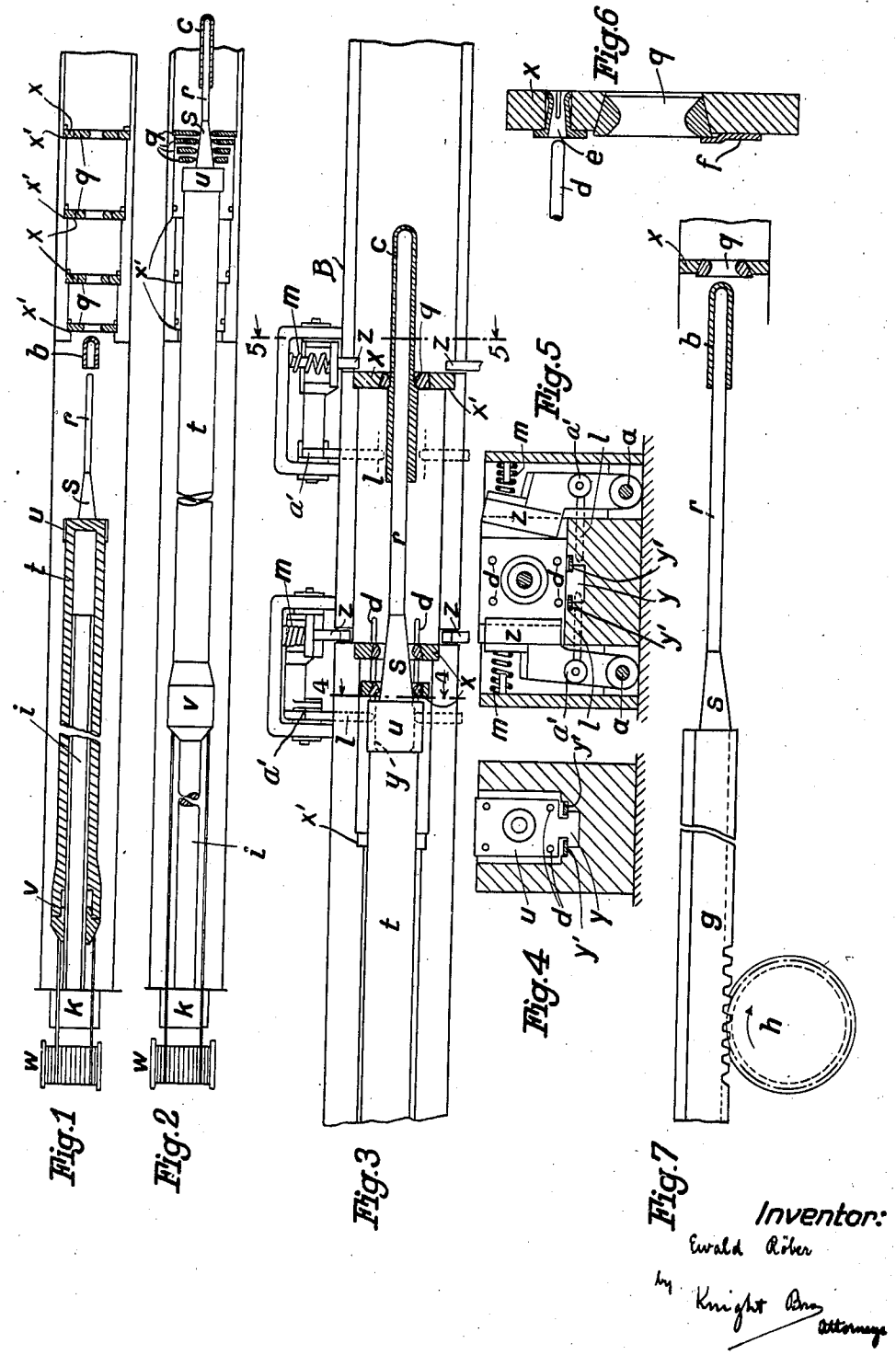
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METAL DRAWING BENCH

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METAL DRAWING BENCH

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The invention relates to a drawing bench for producing tubes or hollow bodies, and in particular to a bench in which the drawing is performed by a push bar which operates the mandrel.

Push benches of this type which perform strokes up to 20 m. and more, have generally a toothed rack drive. This toothed rack carries a long shaft, which in its turn carries a mandrel and passes through the drawing rings. The said shaft has however the disadvantage of being liable to bend out laterally or become curved—while the hollow body or tube is being pushed through the drawing rings—owing to the comparatively high pressure forces imposed on it.

To eliminate this danger I have suggested in my copending application Serial No. 721,019 to design the shaft in the form of a hollow cylinder filled with compressed liquid. The resistance forces are then absorbed directly by the column of compressed water inside the cylinder, whilst the cylinder itself is exposed only to tensile stresses. This system is, however, applicable only for comparatively large diameter tubes. Experience with this type of drawing device has shown, that the hydraulically operated push bar, which contains the pressure fluid, and which must follow the blank through the several dies, becomes too weak in wall resistance when drawing small diameter tubes, to withstand the hydraulic pressure required for drawing small tubes.

In the device forming the object of the present invention, the drawing rings arranged behind one another are carried along in the drawing direction on the mandrel after they have been passed by the blank. This renders it possible to make the push bar which carries the mandrel thicker than the internal diameter of the drawing rings and to choose a cross section area of such an extent as will be required for withstanding the occurring lateral bending forces.

My invention is illustrated in the accompanying drawing in which Figs. 1 and 2 show in semi-diagrammatic form partly in section a plan view of the push bench with movable dies, and in different positions of the push bar.

Fig. 3 shows in plan view and in larger scale the front portion of the push bench which contains the dies.

Figs. 4 and 5 show cross-sections of the push bench on lines 4, 4 and 5, 5 respectively in Fig. 3.

Fig. 6 shows an enlarged section of a die holder, and

Fig. 7 shows in side elevation a rack and pinion operated push bar.

The push bench consists of a bench bed B on which is movably displaced the push bar *t*, which in the modifications Figs. 1, 2, 3 constitutes a cylinder closed at its front end and movable on a fixed plunger *i*, the rear end of the hollow push bar carrying a stuffing box *v*. The front end of the push bar has a guide head *u* which is provided with a guide block *y* (see Figs. 4 and 5) which block runs in guide tracks *y'*, *y'* provided on the bench bed. To this bar head *u* is connected a cone shaped extension *s* which at its end carries the mandrel *r*. Plunger *i* is hollow and terminates at its rear end in a plunger head *k*, in which the several fluid inlets and control devices are disposed (not shown here) by which pressure fluid is admitted to the interior of the hollow push bar *t* through the plunger *i*. Behind the plunger head *k* is provided a windlass *w*, the cables of which are connected to the stuffing box *v* of the push bar. This windlass serves for returning the push bar into retracted position shown in Fig. 1, after it has performed an operating stroke such as is shown in Fig. 2.

At the right hand end of bed B the drawing dies *q* are lined up and spaced apart suitable distances, each die, counting from the left to the right, having a smaller diameter for gradually reducing the blank *b* to the desired final size. Such a die with its holder is illustrated in detail in Fig. 6, where the die ring proper is denoted with *q* and the holder with *x*. The several die holders *x* as shown in Fig. 1 are dimensioned so that in the direction of the run of the blank the outer diameter of each successive die holder increases, so that these several die holders can be moved from the left to the right into the final position shown in Fig. 2 where they are all gathered up on the cone shaped portion *s* of the push bar. In their normal operating positions these die holders rest against shoulders *x'* which are provided in the push bed where they are held in their spaced positions by the individual latches *z*, which are shown in detail in Figs. 3 and 5.

As is shown particularly in Fig. 5 these latches, of which two are provided for each die holder on opposite sides, are constructed as one armed levers, pivoted at *a* and held normally in a position in which they lock the appertaining die holder against its shoulder in the bed, as is shown on the left hand side of Fig. 5, by means of a spring *m*. To each of these levers is pivotally attached a pin *l* which is guided in the bench bed, and which is long enough to protrude with its free end into the guide track of the push bar guide

block y when the latch z is in locking position as shown in Fig. 5. Guide block y is slightly rounded off at both ends as is shown in dotted lines in Fig. 3 so that when this block passes pins l it will push these pins to the left and right respectively, and thus remove the latches from the die holder as is shown at the right hand side of Fig. 5. This occurs at a time when the blank is long past this particular die, and when the bar bead u is about to encounter the die on its working stroke to the right. Thus, the die holder being freed on its seat in the bed will be gathered up by the cone shaped portion s of the bar head and be carried on it to the right. This is shown in Fig. 3 where the first die holder x on the left hand end has been picked up from its seat x' at the left hand portion of Fig. 3 and been carried to the right, and where the bar head u is shown ready to pick up the next die holder x, the latches z of which have just been unlocked. It will be noted that the die holder x with its die q at the right hand end of the series of dies is still locked by its latches z and the blank c is just being pushed through this die.

In order to secure a proper seating of the die holders on the cone shaped portion s when they are gathered up, and in order to maintain the position of the die holders in a vertical plane, positioning pins d (see Figs. 3 through 6) are provided at the four corners of the push bar head u which extend outwardly in the direction of the mandrel. As shown in Fig. 6 in detail the die holders are provided with correspondingly positioned holes in which spring bushings e are disposed which are engaged by the pins d when the particular die holder is gathered up by the cone shaped portion s. In Fig. 3 one die holder has been shown impaled on these pins and the other is just being impaled and gathered up. The die rings q as shown in Fig. 6 are secured in the die holders by locking plates f so that they cannot move to the left, and they are provided with cone shaped seats so that they cannot move in the die holder to the right.

The operation of this arrangement is as follows: As shown in Fig. 1 the push bar t and the mandrel r are in the extreme left hand position in which the end of the mandrel is ready to engage a blank b and to push it successively through the four dies q on its operating stroke to the right during which pressure fluid is supplied through the fixed plunger i into the interior of bar t. During this operating stroke and the passage of the blank through successive dies, the die holders are successively released from their respective seats as described hereinbefore, whereby the push bar is allowed to pass to the extreme right hand position shown in Fig. 2, and past the several places where formerly the dies were located. These released dies, in the manner described hereinbefore, are during this operating stroke gathered up on the cone shaped portion s as shown in Fig. 2. In this figure the blank is shown in its finished form and denoted with c. The finished object can now be removed from the mandrel r.

The return of the dies into their respective operating positions x' occurs on the return stroke to the left of push bar t. When this bar returns, first the largest diameter die holder x will abut against its shoulder x', then the one of the next smaller diameter, and so forth until all die holders have been brought back into their relatively spaced positions shown in Fig. 1. As each die holder slides off the cone shaped portion s, the guide block y of the bar head slides past pins l of the latches thereby opening the two latches to permit the seating of the die holder on the shoulder x', and as soon as the guide block y has passed the two latches snap back in front of the die holder as shown at the right of Fig. 5 thus locking the die holder again in position ready for the next drawing operation.

Push benches with movable die holders operating in the manner just described may also be operated by means of a rack and pinion drive instead of hydraulically as shown in Figs. 1 through 3. Such a rack and pinion drive is shown in Fig. 7 in which the hollow hydraulic cylinder t acting as the push bar is replaced by the rack bar g driven by the pinion h. Otherwise it is assumed that the arrangement operates in the same way as shown in Figs. 1 to 5, namely that the rack bar is permitted on its operating stroke to pass fully to the right such as is shown in Fig. 2 with respect to bar t, and that the head of the rack bar is provided with a guide block y which successively releases the several die holders before their position is passed by the bar head. With such an arrangement a push bench operated by a rack bar may be constructed very materially shorter than was possible hereinbefore where the rack bar could not travel any further than the position of the first die.

For operating the hydraulic arrangement of Figs. 1 and 2 any suitable fluid under pressure may be used.

I claim:

1. In a push bench in combination with a bench bed, die holders containing dies and being removably spaced along the bench bed, a mandrel for pushing the blank through said dies, a push bar connected to said mandrel for operating it, and a guide block at the forward end of said bar and means for guiding it along the bench bed; of means for normally locking each die holder on the bed in its operating position, and means for releasing each holder after the passage of the blank, to permit the holder to be carried along on the mandrel while the latter pushes the blank through the remaining dies.

2. In a push bench in combination with a bench bed, die holders containing dies and being removably spaced along the bench bed, a mandrel for pushing the blank through said dies, a push bar connected to said mandrel for operating it, and a guide block at the forward end of said bar and means for guiding it along the bench bed; of means for normally locking each die holder on the bed in its operating position, and means actuated by said guide block for releasing each holder after the passage of the blank, to permit the holder to be carried along on the mandrel while the latter pushes the blank through the remaining dies.

3. In a push bench in combination with a bench bed, die holders containing dies and being removably spaced along the bench bed, a mandrel for pushing the blank through said dies, a push bar connected to said mandrel for operating it, and a guide block at the forward end of said bar and means for guiding it along the bench bed; of means for normally locking each die holder on the bed in its operating position, and means for releasing each holder after the passage of the blank, to permit the holder to be carried along on the mandrel while the latter pushes the blank through the remaining dies, said holder releasing means comprising a pin for each locking means, disposed in the path of said

guide block, said block being suitably shaped to operate each pin as it passes by it, to release the appertaining locking means.

4. In a push bench in combination with a bench bed, die holders containing dies and being removably spaced along the bench bed, a mandrel for pushing the blank through said dies, a push bar connected to said mandrel for operating it, and a guide block at the forward end of said bar and means for guiding it along the bench bed; of a spring latch for each die holder normally tending to remain in position to lock the die holder in operating position, and means for releasing the latch for each holder after the passage of the blank, to permit the holder to be carried along on the mandrel while the latter pushes the blank through the remaining dies, said releasing means comprising a pin for each latch pivotally attached to it and having its free end disposed in the path of said guide block, whereby it is actuated to remove the appertaining latch from locking position during the passage of the block in either direction.

5. In a push bench in combination with a bench bed, die holders containing dies and being removably spaced along the bench bed, a mandrel for pushing the blank through said dies, a push bar connected to said mandrel for operating it, and a guide block at the forward end of said bar and means for guiding it along the bench bed; of means for normally locking each die holder on the bed in its operating position, and means for releasing each holder after the passage of the blank, to permit the holder to be carried along on the mandrel while the latter pushes the blank through the remaining dies, said mandrel having a cone shaped enlargement forming its connection with said push bar, on which the released dies and holders are gathered up during the operating stroke of the mandrel.

6. In a push bench in combination with a bench bed, die holders containing dies and being removably spaced along the bench bed, a mandrel for pushing the blank through said dies, a push bar connected to said mandrel for operating it, and a guide block at the forward end of said bar and means for guiding it along the bench bed; of means for normally locking each die holder on the bed in its operation position, and means for releasing each holder after the passage of the blank, to permit the holder to be carried along on the mandrel while the latter pushes the blank through the remaining dies, said mandrel having a cone shaped enlargement forming its connection with said push bar, on which the released dies and holders are gathered up during the operating stroke of the mandrel, and positioning pins at the end of said push bar arranged to engage correspondingly positioned openings in said die holders, for positioning the latter when they are gathered on said mandrel.

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