Sept. 8, 1942. H. HEETKAMP 2,295,500

MANDREL GUIDE IN PUSH BENCHES

Filed April 23, 1940 2 Sheets-Sheet 1

Fig. 1

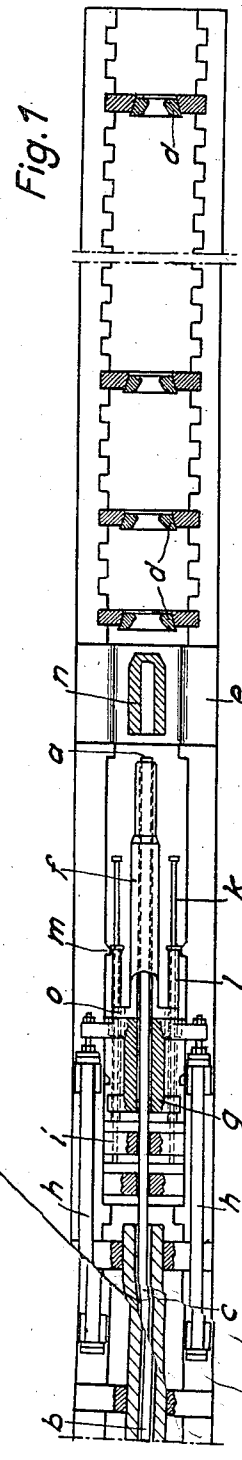


Fig. 2

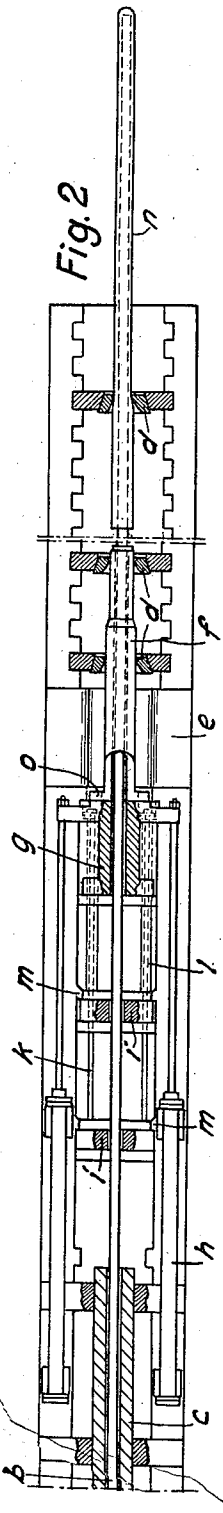
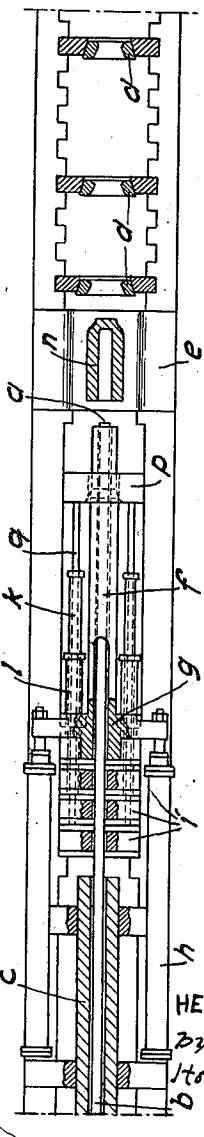


Fig. 3

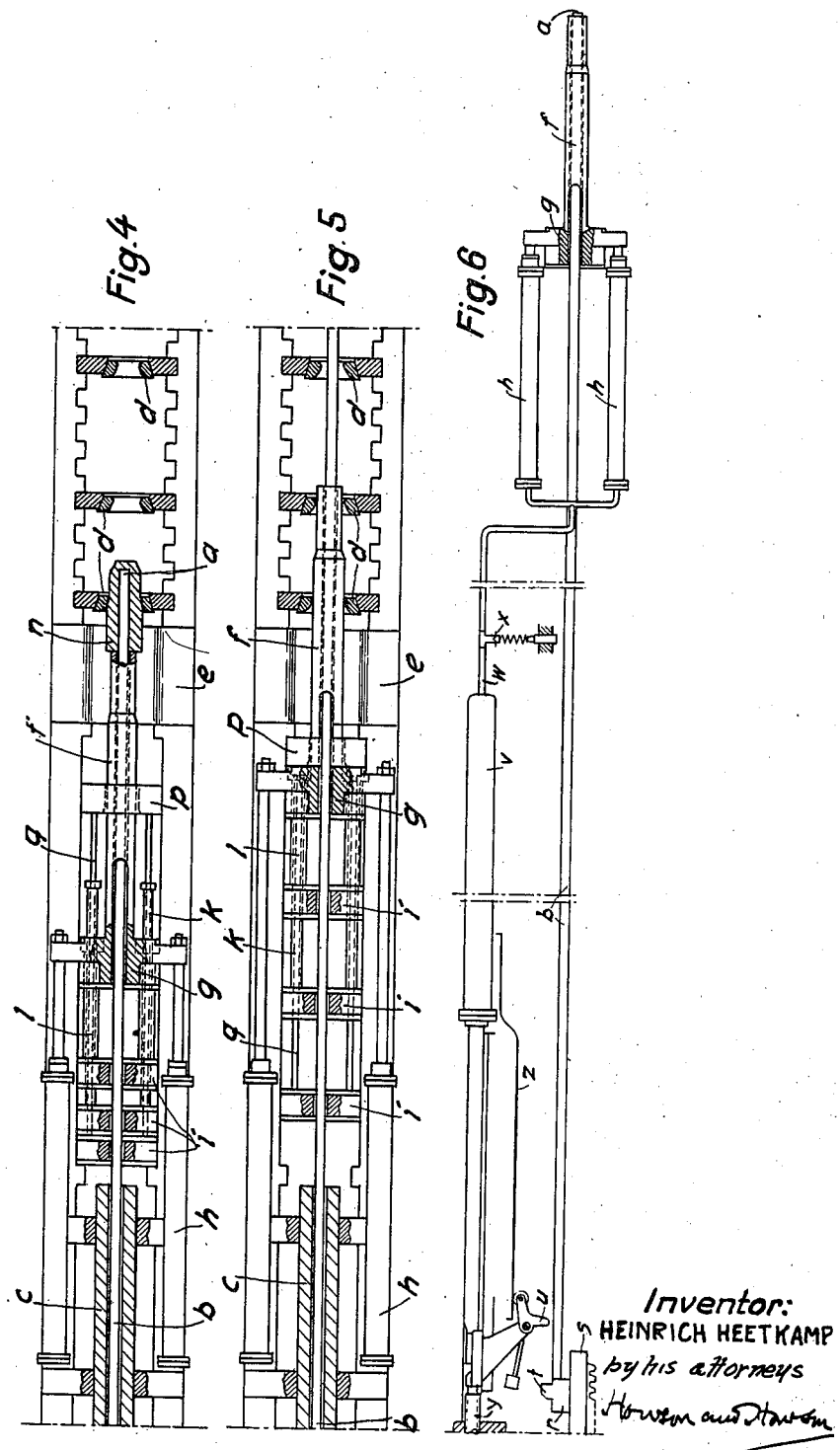


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MANDREL GUIDE IN PUSH BENCHES

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MANDREL GUIDE IN PUSH BENCHES

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8 Claims. (Cl. 205—4)

Guides, through which the mandrels and the mandrel-bars, respectively, of push benches for tubes are guided within the region of the bed for the rack, are already known. Furthermore guides have already been provided between the separate gauge plates of the drawing bench, whereas in the already known designs guides are not provided for the section, in which the hollow work pieces are inserted. This fact implies a considerable danger for the mandrel, in particular as far as the manufacture of tubes of small diameter is concerned, in which another drawback is also observed. If it is intended to manufacture tubes of a small diameter and of great length, a hollow piece is used, which has a very thick wall, as compared with the diameter of the hollow space.

As a consequence thereof the play between the first gauge dies inclusive of the guide rings inserted between them, and the mandrel and mandrel bar will be very considerable. Thus within the region of the initial gauge dies the mandrel will have to bear a very great buckling stress, which is liable to result in permanent deformation of the mandrel and its mandrel bar. A considerable pressure will be created between the mandrel and mandrel bar and the gauge dies, which possibly will incur detrimental damages of the surfaces of the mandrel and the gauge dies, and considerable vibration of the mandrel and the mandrel bar will, moreover, be caused within the initial gauge dies.

In order to overcome the drawback implied in the installation hitherto known, it is hereby proposed under the present invention, in addition to the customary mandrel guides to provide a further guide for the mandrel, which has the shape of a cylindrical sleeve and, longitudinally displaceably within the bed of the drawing bench, encloses the mandrel and the mandrel bar, respectively, so as to guide the mandrel and the mandrel bar, respectively, along the part in which insertion takes place, and within the region of the initial gauge dies. In order to attain this latter end, the guide sleeve varies in diameter corresponding to the width in the clear of the initial gauge dies. The arrangement of a guiding sleeve of such a design offers a possibility of expediting the pushing action caused by the mandrel, namely by using the sleeve as a pressure means. For this purpose the movements of the mandrel and mandrel bar, respectively, and of the guiding sleeve are, first of all, under the present invention, coupled with one another, and furthermore the device used as drive for the sleeve is synchronized in such a way with the drive of the mandrel, that only by the combined forces of the two driving devices is the piece to be drawn pushed through the first gauge dies. This is necessary in order to prevent the pressure means from operating to push the hollow piece through the first gauge die alone and without the aid of the mandrel, and also in order to prevent the latter from acting independently, because either alternative would result in disturbances, and in the second case it would, in particular, not be possible to overcome that drawback, which is to be prevented, i. e. that the mandrel perforates the bottom of the hollow work piece.

Figures 1 to 5 of the drawings illustrate two practical embodiments of the arrangement of the sleeve. The manner in which the movements and forces of the mandrel drive and of the device used as drive of the sleeve are coupled, can be seen in Figure 6.

As can be seen in Figures 1 and 2, a mandrel *a* is attached to mandrel bar *b*. The guides *c* are used for the purpose of bringing about the guiding effect within the region of the rack bed. The gauge dies are marked *d*, whereas the insertion part is marked *e*. The additional guiding action under the present invention is performed by guide sleeve *f*, which is detachably mounted on slide *g*. The external diameter of the sleeve *f* is adequately stepped in accordance with the number of dies through which it will have to pass, whereas the inner diameter has the size required for housing the mandrel. The wall of the sleeve *f* is cut away at one side for a short distance adjacent the slide *g* so that the opening in the sleeve for the mandrel has the form of a slot or channel for a portion of its length. The sleeve *f* is detachably mounted in such a way that it can be changed, if the bench is to be adjusted for tubes of another size. The slide *g* can be shifted by means of the two hydraulic cylinders *h*.

In order to provide the necessary guiding effect for the mandrel and the mandrel bar in the region between the slide *g* and the stationary guides *c*, when the slide *g* is placed in its advanced position, displaceable guides *i* are provided which by the movement of slide *g* are shifted into their position by means of draw bars *k* and *l*. By stops *m* which, for instance, are fixed to the covering ledges of the guide for the slide *g*, the guides *j* are prevented from being drawn along with the mandrel and mandrel bar, when in motion.

The action of the guide *f* for the mandrel bar,

which can be passed through the first gauge dies, takes place as follows: The hollow piece *n* is placed in the insertion part of the drawing bench, whereupon the latter is started, and slide *g*, when the mandrel enters the hollow piece and pushes it through the first gauge die, is started in such a way that guide tube *f* will follow the work piece *n*. As soon as work piece *n* has passed the first gauge die, the guide tube will enter the latter and will further follow the work piece, until it also enters the second gauge die, where it will stop. As soon as the work piece has been completely drawn, the mandrel bar is returned into its rearward position, and another mandrel inserted in the drawing bench. The guides on slide *g*, the displaceable guides *i* and the first part of the stationary guides *c* are for this purpose provided with the customary locking devices. Part *o* of guiding tube *f* is of open design for insertion of the mandrel. Only after the new mandrel has been inserted, guide tube *f* is withdrawn from the gauge die by returning slide *g*, and the insertion part *e* of the drawing bench made ready to house the following work piece.

An altered design of the guide for the mandrel bar, which can be passed through the first gauge dies, is shown in Figures 3 to 5.

Guide tube *f* is attached to a slide *g* which is considerably shorter than that of the first example. A displaceable guide *p* is, however, arranged in front of this slide *g*, and serves as a guide for the guiding tube *f*. By this guide *p* the guiding tube *f* is prevented from any possible lateral deflection, when the work piece *n* is pushed by the mandrel through the first gauge die. By distance rods *q* guide *p* is, for instance, connected with the last one of the displaceable guides *i*. The other displaceable guides *i* are, as in the first example, provided with draw bars *k* and *l*, by which they are drawn into their positions when guide tube *f* is inserted in the first gauge die. The guide *i* connected with guide *p* is drawn into its position by the guide *p* being shifted by slide *g*, guide *p* engaging the front of the latter.

In this example the guides *i* are prevented by the rods *k*, *l* and *q* from carrying out the full movement of the mandrel and mandrel bar. In the case of this arrangement the manner of action is the same as that of the first example. In Figure 4 it can furthermore be seen, how the sleeve *f* acts to apply pressure in combination with the mandrel, and thereby expedites the pushing action.

In order to bring about the coupling with one another of the movements and forces of the device used as a drive for the sleeve *f* and of the device driving the mandrel, a device can be provided, which is diagrammatically shown in Figure 6.

Shoulder piece *r*, by which rack *s* of the drawing bench is connected with mandrel bar *b*, is provided with a projection *t* which engages a pivotable catch *u*, which latter is connected with the plunger piston of pump cylinder *v*, so as to operate the pump piston. By a conduit *w* the cylinder *v* is connected with cylinders *h*, by which guide tube *f* is shifted, which latter acts as a pressure means. A pressure regulating valve *x* is inserted in conduit *w*. In its position of rest the plunger piston of the pump cylinder *v* rests against adjusting spindle *y*. By a curved guide surface *z* catch *u* is controlled in such a way that after a certain distance it will be released by the projection *t*.

The manner of action of the device illustrated in Figure 6 is as follows:

Upon the commencement of a new working stroke the position of the parts of the drawing bench is that shown in the illustration. By adjusting spindle *y*, the distance between projection *t* and catch *u* is so adjusted that upon starting the drawing bench, projection *t* will engage catch *u* and the frontal surface of the mandrel will project from the frontal surface of guide tube *f* by a distance which is about the same as the length of the inner aperture of the hollow piece *n*. Thereupon the plunger piston of pump cylinder *v* is advanced with the same velocity as the push gear, whereby guide tube *f* will also be moved with the same velocity as the push gear, because the surface of the cross section of the pump plunger is equal to the aggregate surface of the pistons of cylinders *h*. When the work piece touches the gauge die, it will be stopped for a moment, because regulating valve *x* is adjusted in such a manner, that the pressure existing in cylinders *h* will not be sufficient to push the work piece through the gauge die. The mandrel alone will advance further, until it touches the bottom of the piece to be drawn, when, as from that moment, the work piece will be pushed through the gauge die by the action of the mandrel and that of the guiding tube. The excess of water supplied by pump cylinder *v* during this period, is discharged by valve *x*. As soon as guide tube *f* has reached its farthest point, the entire quantity of water supplied by pump *v* will be discharged. Soon thereafter catch *u* will, however, enter the region of the curved part of the guide surface *z* and will thus be caused to be released from the projection *t*, whereby the pump will be stopped during the balance of the stroke of the push gear. Upon withdrawing guide tube *f* from the gauge dies, the quantity of water displaced from cylinders *h* will be fed to the pump. Thereupon such a quantity of water will be supplied to pump *v*, that its plunger piston will rest against adjusting spindle *y*.

What I claim is:

1. A guide for the mandrel of push benches for drawing work pieces into tubes, comprising a cylindrical sleeve which receives the mandrel and the mandrel bar respectively of the bench, said sleeve being arranged on the bed of the push bench so as to be longitudinally displaceable and adapted to guide, after having been pushed into the insertion part and the dies of said bench in back of the work piece, the mandrel and the mandrel bar respectively within the insertion part and within the region of the first dies.

2. In a guide as set forth in claim 1, said sleeve varying in width according to the inner diameter of the first dies.

3. In a guide as set forth in claim 1, said sleeve, for insertion of the mandrel, providing a longitudinal slot extending over a portion of its length.

4. In a guide as set forth in claim 1, said sleeve being fixed to a longitudinally displaceable slide, which is connected to additional, longitudinally displaceable guides for the mandrel bar and mandrel.

5. In a guide as set forth in claim 1, said sleeve being fixed to a longitudinally displaceable slide, which is connected to additional, longitudinally displaceable guides, some of said guides adapted to guide the mandrel and the mandrel bar respectively whereas the other part of the guides serves for the purpose of supporting said sleeve.

6. In a guide as set forth in claim 1, means for coupling the movements of the mandrel and mandrel bar respectively and of said sleeve in such a way that the sleeve serves as an additional pressure means in order to expedite the pushing of the work piece through the first dies.

7. In a guide as set forth in claim 1, driving means for said sleeve and said mandrel, said driving means being synchronized in such a way that the work piece is pushed through the first dies only by the combined forces of both driving means.

8. In a guide as set forth in claim 1, driving means for said sleeve, and a limiting element adapted to restrict the forces of said driving means in such a way that the work piece is pushed through the first dies only by the combined forces of the sleeve acting as a pressure means and of the mandrel.

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