United States Patent

Groos

[15] **3,675,457**

[45] **July 11, 1972**

[54] METAL-TUBE EXTRUSION PRESS

[72] Inventor: **Horst Hans Groos**, Metzkausen, Germany

[73] Assignee: **Schloemann Aktiengesellschaft**, Duesseldorf, Germany

[22] Filed: **Nov. 17, 1969**

[21] Appl. No.: **877,146**

[52] **U.S. Cl.** **72/265**, 72/273

[51] **Int. Cl.** **B21c 23/02**

[58] **Field of Search** 72/263, 264, 265, 266, 267, 72/268, 269, 273

[56] **References Cited**

UNITED STATES PATENTS

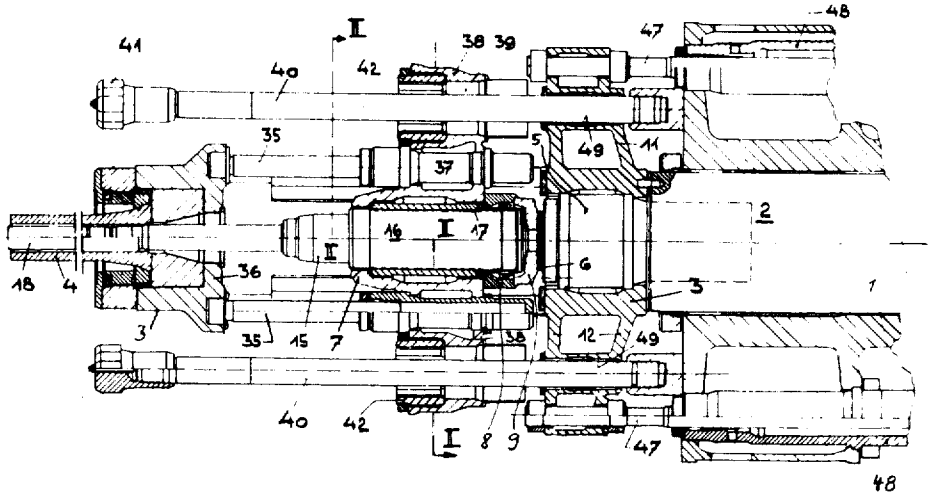
3,143,211 8/1964 Krause et al. 72/265

Primary Examiner—Charles W. Lanham
Assistant Examiner—Michael J. Keenan
Attorney—Holman & Stern

[57] **ABSTRACT**

A metal-tube extrusion press, provided with a drive, arranged in the main extrusion piston, and movable independently towards the press ram, for the piercing mandrel, which is held in a piercing-mandrel crossbar axially displaceable in the crossbeam and which projects with lateral jibs or extensions from the crossbeam, and is axially adjustable relatively to the latter, wherein jibs or extensions, provided with abutments, can be secured relatively to the extrusion cylinder by means of abutment rods rigidly connected with the latter, with the abutments being rockable outwards in the jibs transversely to the direction of extrusion, out of reach of the abutments on the abutment rods.

3 Claims, 5 Drawing Figures



PATENTED JUL 11 1972

3,675,457

SHEET 1 OF 5

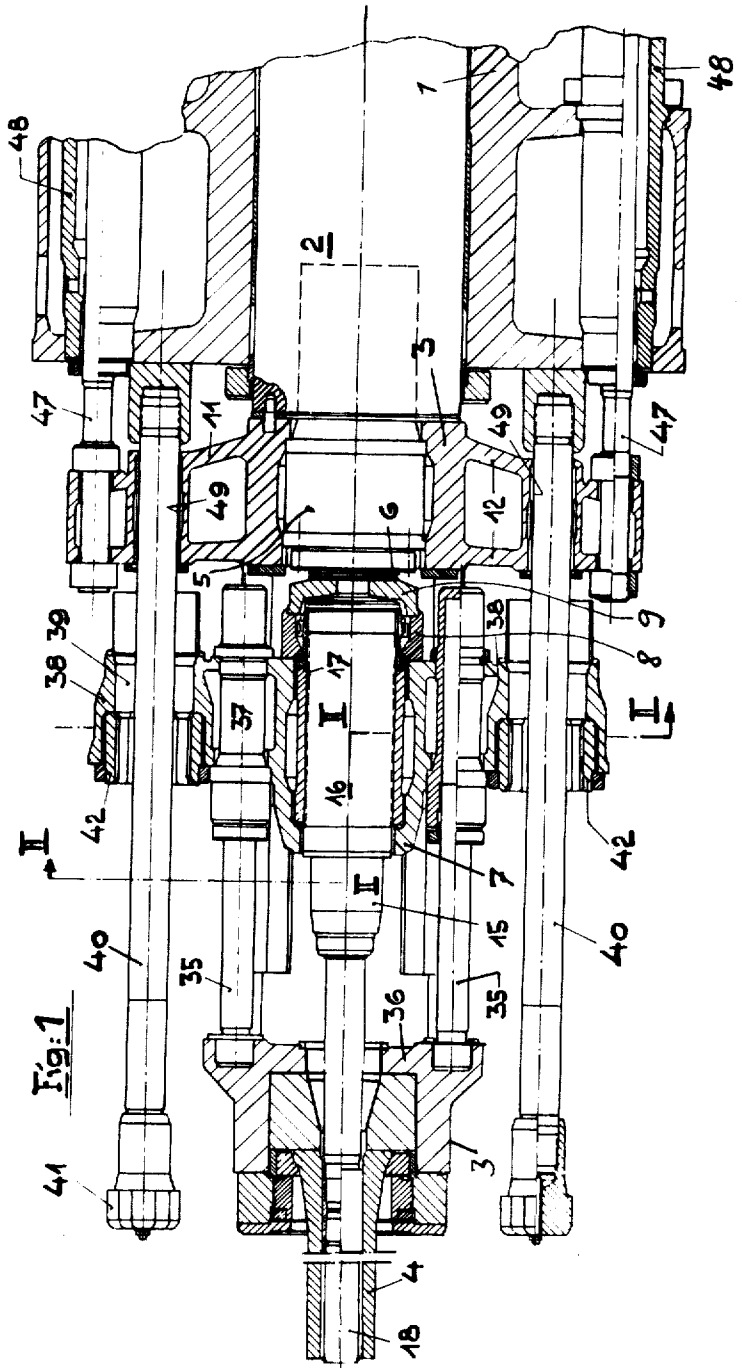


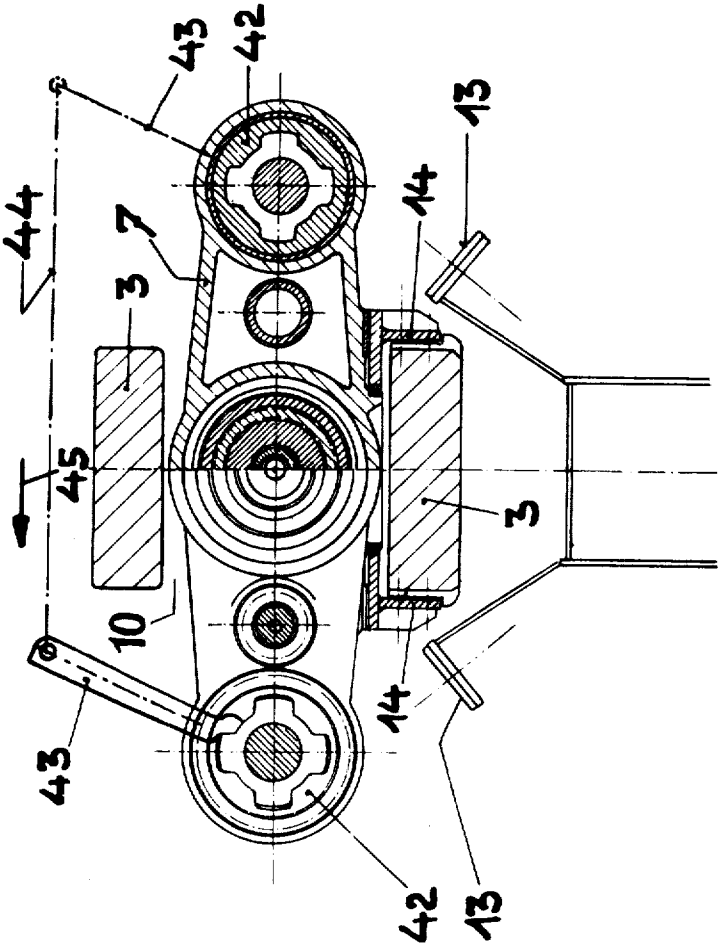
Fig: 1

INVENTOR.
HORST HANS GROOS.

BY Holman, Glascock, Downing & Seibold,

ATTORNEYS

Fig. 2



INVENTOR.
HORST HANS GROOS.
BY Holman, Glascock, Downing & Seibold
ATTORNEYS

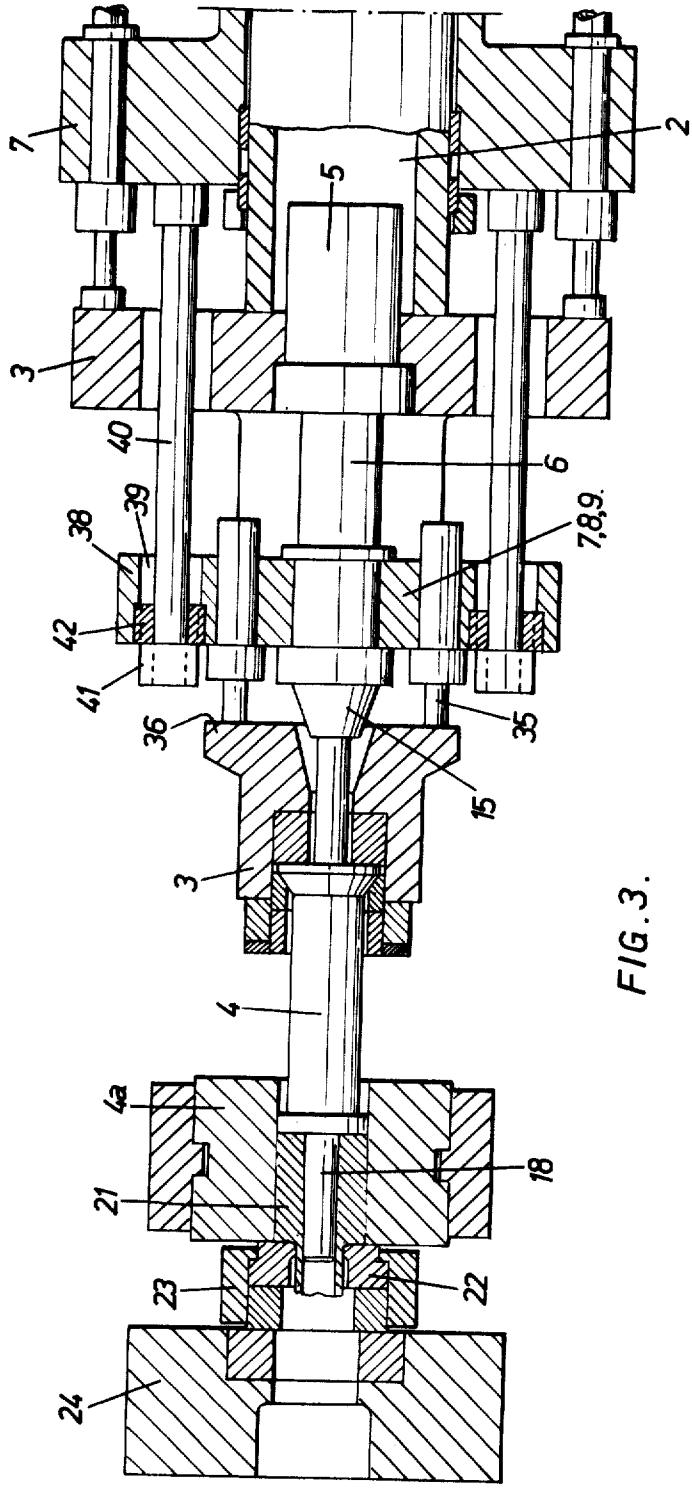


FIG. 3.

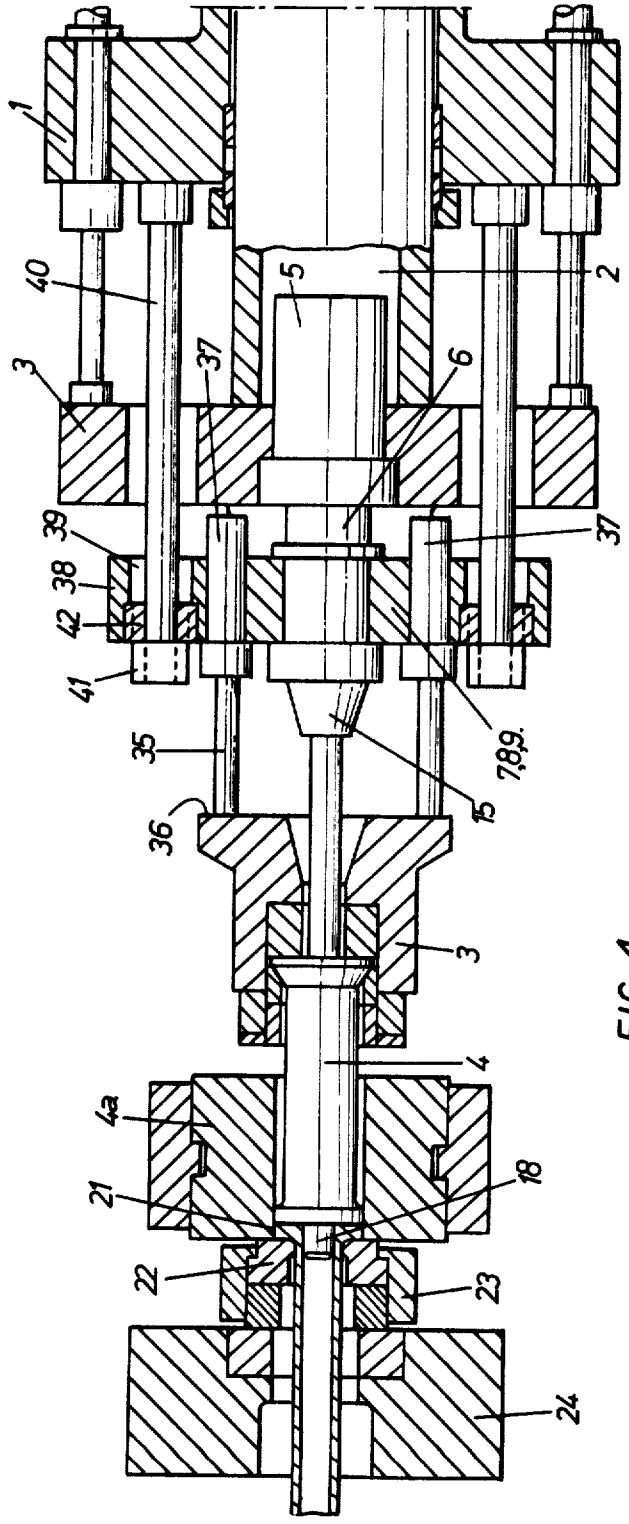


FIG. 4.

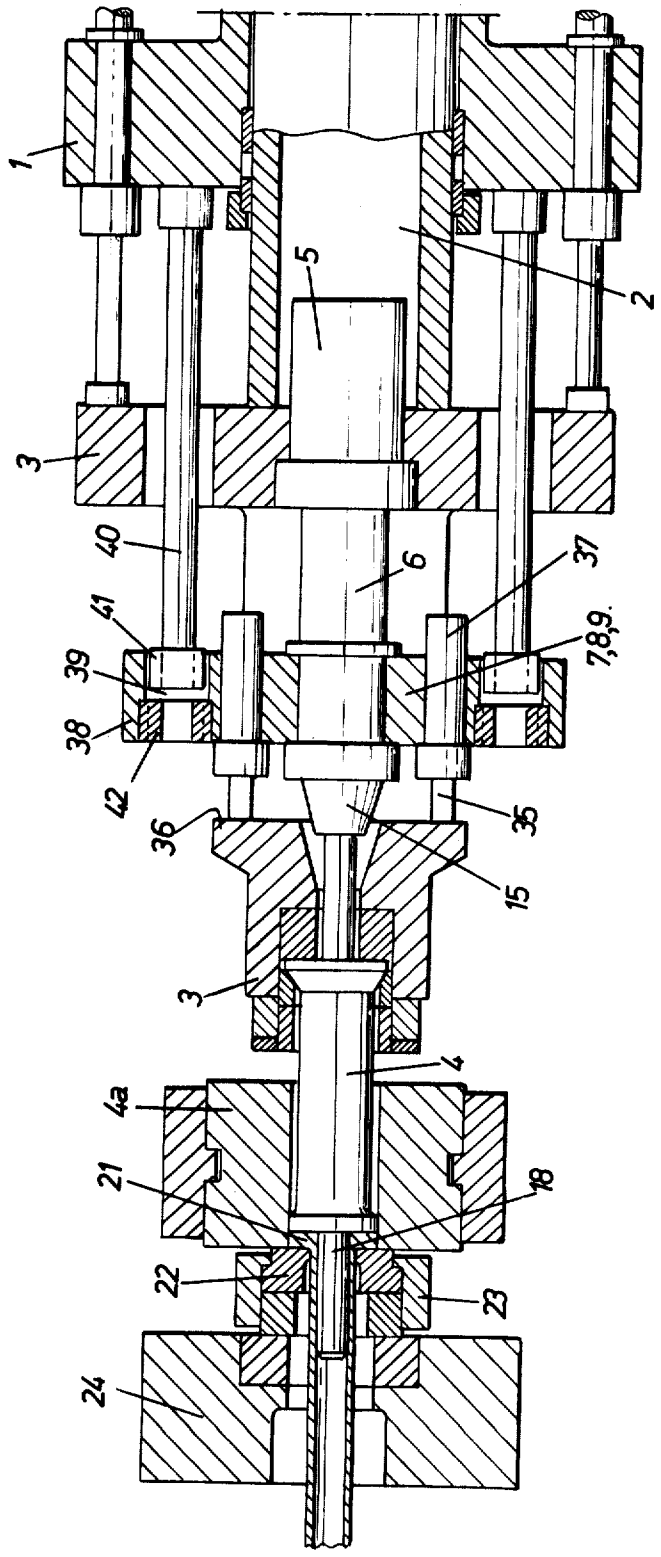


FIG. 5.

METAL-TUBE EXTRUSION PRESS

BACKGROUND OF THE INVENTION

This invention relates to a metal-tube extrusion press, provided with a piercing-mandrel piston and cylinder drive which is arranged in the main extrusion piston, the piston of the mandrel drive being independently movable of the press ram. The piercing-mandrel is held in a piercing-mandrel crossbar, which is axially displaceable in a moving crossbeam. The crossbar has lateral jibs or extensions projecting from the crossbeam, the piercing-mandrel and is axially adjustable relative to the crossbeam. The invention relates more particularly to the fixability of the jibs, provided with abutments, in relation to the extrusion cylinder, by abutment rods connected with the latter.

In a press of this nature, the piercing mandrel, after the conclusion of the piercing operation, can be held fast with its tip in the aperture of the die, and the metal tube can be extruded, over the stationary mandrel, by the succeeding extrusion operation. In order, however, to counteract excessive wear of the mandrel tip, the extrusion is in many cases, preferably effected over the mandrel floating with it, in which case the mandrel should be free to follow without hindrance the flowing movement of the material.

There is indeed known a metal-tube press, wherein the adjusting of the mandrel stroke works in such a way that the mandrel rod, together with the mandrel crossbar, is displaceable by means of displacing spindles in and relatively to the moving crossbeam. In the jibs of the mandrel crossbar are arranged abutment sleeves, which are guided on rods secured to the extrusion cylinder, with abutments being provided at the ends of these rods to co-operate with the abutment sleeves. To compensate for the adjustment of the mandrel stroke, these abutment sleeves are however, so constructed that they can be retracted in the jibs so far that even for the extrusion of a tube over the mandrel floating with it, a sufficient travel up to the contact of these abutment sleeves is provided (U.S. Patent No. 3,143,211).

In the above-mentioned metal-tube press, however, in which the piercing mandrel is adjustable relatively to the piercing-mandrel crossbar, the distance between the abutments on the jibs of the piercing-mandrel crossbar and the abutment rods always remains constant. An insertion of such displaceable abutments in the jibs would have had the disadvantage that only the requisite removal of these abutments, when changing over from extrusion over the stationary mandrel to extrusion over the jointly floating mandrel, would involve very costly and constructionally expensive means. In addition the shifting or adjusting of the abutment, during the transition from one method of extrusion to the other, would take rather a long time, if the abutment consists of a spindle sleeve which is held by an external screw thread in a nut rotatably supported in the jib, with the nut being drivable by a motor by way of a worm-wheel and bevel-wheel gear.

Now the object of the present invention is to attain, by constructionally simple means, a possibility of a quick transition from extrusion over a stationary mandrel to extrusion over a floating mandrel, and vice versa.

SUMMARY OF THE INVENTION

For the solution of this problem, in a metal-tube press of the kind hereinbefore set fourth, it is proposed to make the abutments rockable in the jibs transversely to the direction of extrusion, out of alignment with the abutments on the abutment rods. The requisite path or travel of adjustment and also the time required for adjustment, will thereby be considerably shortened, and the possibility for a simple manual or hydraulic operation of the adjustment is provided.

According to the invention, it is furthermore proposed to construct the abutments as abutment sleeves supported rotatably and axially undisplaceably in the jibs, and to provide them internally with a multi-keygroove or splined profile, with the abutment rods extending through the abutment sleeves

and being equipped at their free ends with abutment collars, which are provided externally with multi-keyway or splined profiles adapted to the internal profiles of the abutment sleeves.

In addition, there may advantageously also be provided levers secured to the abutment sleeves perpendicularly to the axes thereof and parallel to one another, with these levers being pivotally connected at their free ends to a control rod.

The use of rotatably mounted abutment sleeves with splined or multi-keyway profiles presents the further advantage, as compared with the other possible ways of rocking the abutments that would come within the scope of the invention, such for instance as the radial outward travel of abutment segments, or even the outward rocking of abutment halves, that by an appropriately large number of keyways, the adjustment angle can be kept very small, and that furthermore, in rocking the abutment out, the overhang of abutment segments or abutment halves is avoided.

One embodiment of a metal-tube extrusion press constructed according to the invention is illustrated in the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view, partly in section in the region of the crossbeam and the piercing-mandrel crossbar;

FIG. 2 is a view taken along the line II — II in FIG. 1, the view looking in the direction of the arrows; and

FIG. 3 is a schematic plan view, partly in section, corresponding to FIG. 1, but showing the container, die and bolster, shortly after piercing has been completed;

FIG. 4 is a schematic plan view, partly in section, corresponding to that of FIG. 3, but showing the arrangement at a later stage, with a stationary mandrel; and

FIG. 5 is a schematic plan view, partly in section, corresponding to that of FIG. 3, but showing the arrangement at a later stage, with a floating mandrel.

DETAILED DESCRIPTION OF THE DRAWINGS

In an extrusion cylinder **1** a longitudinally slidable hollow extrusion piston **2** acts upon a crossbeam or platen **3**. The latter carries in front a hollow press ram **4**, which, in a known manner, can be pushed into a container **4a** shown in FIGS. **3**, **4** and **5** for the extrusion of a billet **21** placed therein through a die **22**. The die **22** is held in a die holder **23** and supported by a bolster **24**. In the crossbeam **3** is mounted a piercing cylinder **5**, the rear end of which projects into the hollow extrusion piston **2**. In the piercing cylinder **5** there slides a piercing piston **6**, which can displace a piercing-mandrel crossbar, consisting of three parts **7**, **8** and **9**, independently of the extrusion piston **2**, in the direction of extrusion. In the piercing-mandrel crossbar there is a longitudinally adjustable mandrel-holder-carrier **15**, which has, at its right-hand end (in FIG. **1**), a mandrel-holder-carrier spindle **16**, which engages, with an external screw thread **17**, in a piercing-mandrel stroke device not further described. The mandrel-holder-carrier **15** is connected in a known manner at its left-hand end (in FIG. **1**) with a piercing-mandrel **18**, which projects through the hollow press ram **4**, and is guided by the latter. Owing to the longitudinal adjustability of the mandrel-holder-carrier **15** in the piercing-mandrel stroke device, variations in the length of the mandrel **18**, occasioned by constant wear, are so far compensated for that the stroke of the piercing-mandrel crossbar always remains the same.

The crossbeam **3** slides upon inclined guides **13**, shown in FIG. **2**, while the piercing-mandrel crossbar **7**, **8**, **9** is longitudinally displaceable with guiding bars **14** upon the lower part of the crossbeam **3**. As shown in FIGS. **3-5**, **5**, the press ram and mandrel **18** act on the billet **21** in the container **4a**. The billet **21** is extruded through the die **22** held in the die holder **23** and supported by the bolster **24**.

On the part **7** of the piercing-mandrel crossbar are arranged lateral jibs **38**, which project through window apertures **10** of

the crossbeam 3. In the jibs 38 are secured crossbar retracting cylinders 37, and pistons 35 thereof are supported on a partition 36 of the crossbeam 3.

In the jibs 38 there are furthermore apertures 39, through which abutment rods 40 extend, which are rigidly secured by their right-hand ends (in FIG. 1) to the extrusion cylinder 1, and at their other ends are each provided with an abutment collar 41. In the apertures 39 of the jibs 38, abutment sleeves 42 are so supported as to be rotatable but axially undisplaceable, and are provided internally with a splined or multi-keyway profile. To the abutment sleeves 42, levers 43 are also secured, perpendicularly to the sleeve axis and parallel to one another. At their free ends the levers 43 are pivotally connected, as shown in FIG. 2, to a control rod 44. The abutment collars 41 are adapted externally to the shape of the cavities in the abutment sleeves 42, and have, in relation to the splined-groove profile of the abutment sleeves 42, so much clearance that the abutment sleeves 42, in the position shown in FIG. 2, can easily be slipped over the abutment collars 41. With the number of splined key grooves in the abutment sleeve 42 selected in the embodiment illustrated, it is sufficient to rock the lever 43 through an angle of 45° by moving the control rod 44 in the direction of the arrow 45, in order to turn the abutment sleeves 42 into the abutting position. In this event, the keys of the abutment sleeve 42 will be located facing the keys of the abutment collar 41, as soon as the piercing operation is completed, and the tip of the mandrel rod has penetrated into the die 22 to a depth requisite for the extrusion of the metal tube.

To the lateral arms 11 and 12 of the crossbeam 3 are rigidly attached pistons 47, which extend into the press-retracting cylinders 48 rigidly connected with the extrusion cylinder 1. Furthermore, the arms 11 and 12 are each formed with a break or aperture 49, through which the abutment rods 40 extend. These apertures 49 are constructed as supports for the abutment rods 40.

The object of the invention is to enable the quick transition from extrusion over a stationary mandrel to extrusion over a floating mandrel and vice versa. In brief, the abutment members in the lateral extrusions of the mandrel cross-bar are defined as sleeves with internal abutment means which can, in certain positions of the sleeves, slide over the respective collars which are fixedly secured to the ends of the abutment rods connected to the extrusion cylinder and extending through the cross-bar extensions. Thus, the complications of providing for axial displaceability of the abutments in the cross-bar extensions is avoided. Furthermore, changeover from extruding over a stationary mandrel to extruding over a floating mandrel, or vice versa, is an abrupt one in that the difference in the length of displacement of the mandrel is constant and is achieved simply by rotating the abutment sleeves until the sleeve and collar abutments are out of alignment.

FIG. 3 shows the position of the extrusion press when piercing has been completed but before the extrusion process per se has begun. A length of tube has been forced through the die 22 and the tip of the mandrel 18 projects through the die.

FIGS. 4 and 5 illustrate the position of the press at the end of extrusion, and in both cases the front end of the press ram 4 is close to the die 22. However, the piercing mandrel 18 is fixed in FIG. 4 but is floating in FIG. 5.

As can be seen from FIG. 3, the mandrel cross-bar parts 7, 8, 9 have travelled forward during piercing (driven by the piercing piston 6) until the abutment sleeves 42 abut against the abutment collars 41, thus preventing any further movement of the mandrel 18 because the rear ends of the abutment rods 40 are rigidly fixed to the extrusion cylinder 1. In this position, the lands on the splines of the abutment collars 41 abut against the lands on the splines of the abutment sleeves 42.

For fixed mandrel extrusion, as shown in FIG. 4, the extrusion piston 2 drives the press ram 4 into the container 4a while the piercing mandrel 18 is held back by means of the abutment rods 40, and remains in the same position.

For floating mandrel extrusion, starting from the position of the extrusion press shown in FIG. 3, the levers 43 are rocked to turn the abutment sleeves 42 so that the lands on the splines of the abutment collars 41 pass between the lands on the splines in the abutment sleeves 42, allowing the mandrel 18 to be carried forward by the metal during extrusion, as shown in FIG. 5.

1 Claim:

1. A metal-tube extrusion press, comprising: an extrusion cylinder, a main extrusion piston slidably in the extrusion cylinder, a crossbeam carried for displacement by the main extrusion piston, a press ram carried by the cross beam, a piercing-mandrel, a piercing-mandrel crossbar locating the piercing-mandrel in position and slidable within the cross-beam, means located in the main extrusion piston for independently moving the piercing-mandrel crossbar, lateral extensions of the piercing-mandrel crossbar projecting out of the crossbeam, abutment rods rigidly connected to the extrusion cylinder and extending in the direction of extrusion through the lateral extensions of the piercing-mandrel crossbar, an axially fixed abutment sleeve rotatably mounted in each lateral extension of the piercing-mandrel crossbar around the respective abutment rod, and an abutment collar fixedly secured to the end of each abutment rod remote from the extrusion cylinder, each abutment sleeve having internal abutment means and each abutment collar being provided with complementary external abutment means, and each abutment sleeve being rotatable between a first position in which the abutment means thereon are out of alignment with the abutment means of the respective abutment collar to permit the sleeve to slide over the collar, and a second position in which the collar and sleeve abutment means are aligned to prevent the sleeve from sliding over the collar.

2. The metal-tube extrusion press as claimed in claim 1, in which the abutment sleeves are provided with internal splines and the abutment collars being provided with complemental external splines.

3. The metal-tube extrusion press as claimed in claim 1, in which parallel rocking levers are fixedly secured to the abutment sleeves, and a control lever interconnecting the free ends of the rocking levers for movement of the abutment sleeves in unison between said first and second positions.

* * * * *