Jan. 22, 1963 F. J. KENT ET AL 3,074,549

TOOL ASSEMBLY FOR A METAL WORKING PRESS

Filed Dec. 29, 1959 2 Sheets-Sheet 1

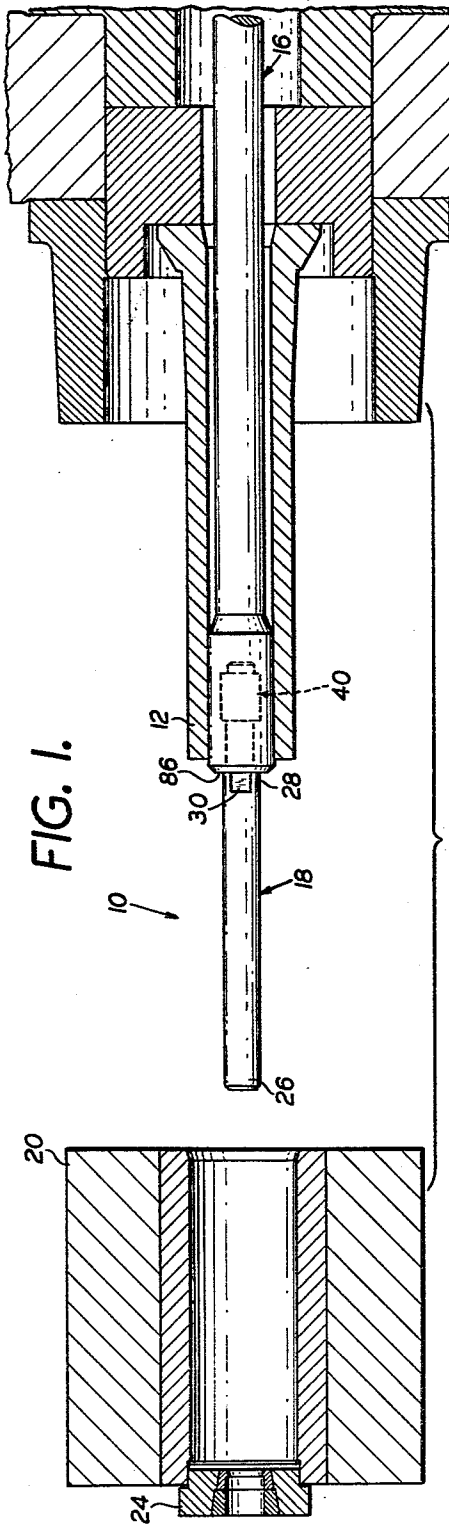


FIG. 1.

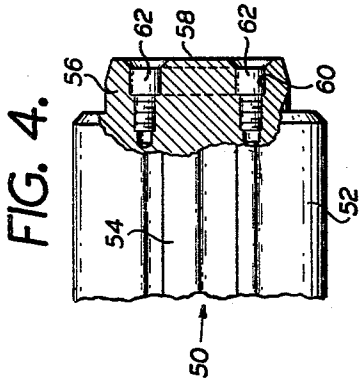


FIG. 4.

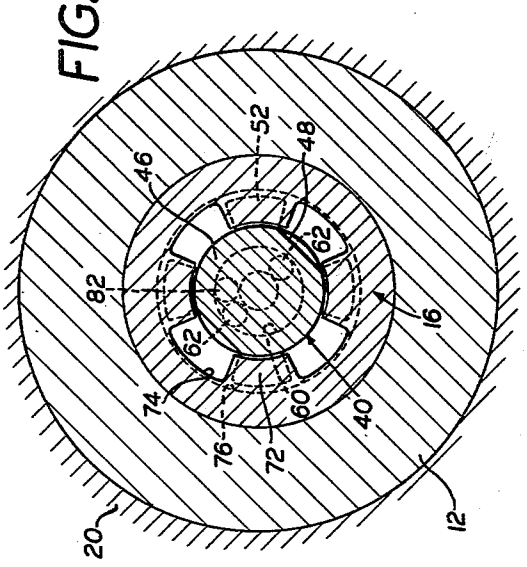


FIG. 6.

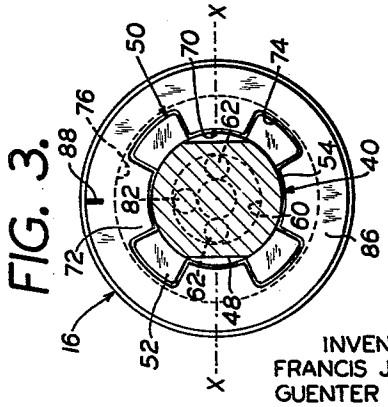


FIG. 3.

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TOOL ASSEMBLY FOR A METAL WORKING PRESS

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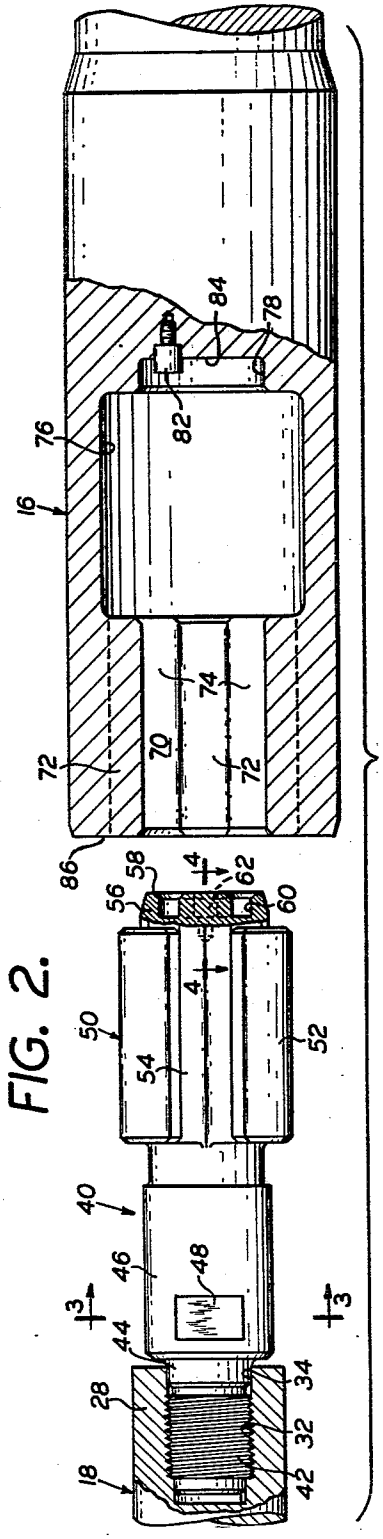
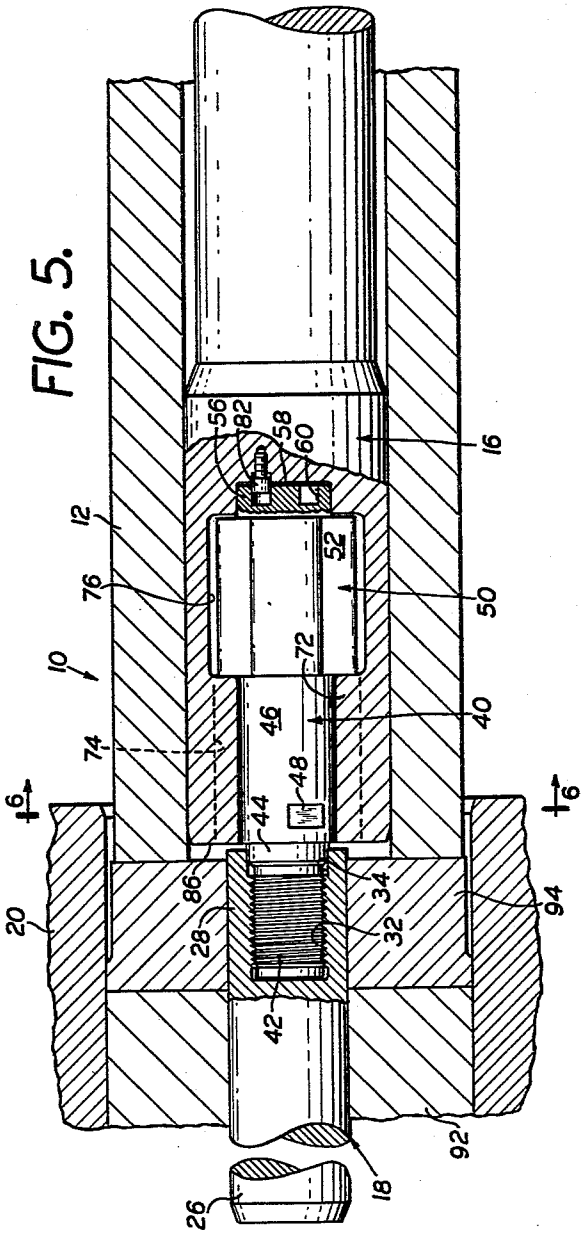


FIG. 2.

FIG. 5.



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TOOL ASSEMBLY FOR A METAL WORKING PRESS

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This invention relates to a tool assembly for a metal working press, and more particularly to a tool assembly comprising a mandrel and a mandrel holder.

Mandrels of the type used in metal presses are subject to high wear and must be replaced frequently. In addition, if the metal is worked at high temperatures, the mandrels should be changed often for proper cooling.

To avoid excessive down time of the press, it is imperative to provide for rapid mounting and dismounting of the tools. If the mandrel and its holder engage each other directly by means of threads, the time required to make or break the connection is relatively long. Other arrangements have been proposed which permit a faster change but they require a special shape, increased weight and special machining of the mandrel proper. This results in considerably higher cost of the mandrel and is not economical since this tool is an expendable part and normally made of high grade material.

It is an object of the invention to provide an improved tool assembly for a metal working press, which permits rapid change of mandrels in a simple and economical way.

It is another object of the invention to provide an improved tool assembly for a metal working press, which permits rapid change of mandrels while insuring proper guidance thereof.

It is also an object of the invention to provide an improved tool arrangement for a metal working press, which permits easy assembly in two alternative positions.

It is a further object of the invention to provide an improved tool assembly which has a bayonet joint and is provided with easily machinable means determining the locked position of the joint.

Various other objects, features and advantages of the invention will become apparent as the description proceeds.

In the drawings which illustrate an embodiment of the invention by way of example,

FIG. 1 is a fragmentary elevational, sectional view of a metal working press with the parts positioned for the changing of tools;

FIG. 2 is an enlarged view of the tools prior to their complete assembly, the tools being partly shown in section;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is a fragmentary section taken along line 4—4 of FIG. 2 but shown on a larger scale;

FIG. 5 is an enlarged elevational section showing the tools in operating position; and

FIG. 6 is a section taken along line 6—6 of FIG. 5 but shown on a larger scale.

Referring to the drawings, the metal working press generally indicated at 10 is adapted for the extrusion of tubes and comprises a reciprocable hollow, pressure applying stem or plunger 12, a mandrel holder generally indicated at 16 which is reciprocable in the hollow stem 12, a mandrel generally indicated at 18, a bushed container 20, and a die assembly 24.

Mandrel 18 has a front end 26 for engaging the metal to be worked, and a rear end 28. The latter is provided

with a pair of wrench flats 30 and a threaded bore 32 (FIG. 2) terminating in a smooth counterbore 34.

A substantially plug-shaped adapter generally indicated at 40 which serves to mount the mandrel 18 in the press, is shown in FIG. 2 spaced from the holder 16 but ready to be inserted therein. The adapter has an externally threaded end 42 for engaging the threaded bore 32 of the mandrel, and a comparatively short cylindrical guide portion 44 which closely fits counterbore 34 to center the mandrel relative to the adapter. Further, the adapter is provided with an intermediate cylindrical portion 46 having a pair of wrench flats 48 thereon. An adjacent portion of larger diameter is in the form of a serrated bayonet pin generally indicated at 50 which comprises four external, axially directed projections or teeth 52, and four corresponding grooves 54.

A terminal cylindrical portion 56 extends from the bayonet pin, and the terminal face 58 of the adapter is provided with a circular or annular groove 60. A pair of opposite abutments such as cap screws 62 (FIG. 4) are positioned in groove 60 and secured to the adapter. When viewed from one of the ends (see FIG. 3), the pair of flats 48, the cap screw 62, and one pair of opposite grooves 54 are aligned along a common axis X—X, which will assist in positioning the parts properly for assembly as set forth later.

Mandrel holder 16 is provided with a bayonet socket generally indicated at 70 (FIG. 2) and dimensioned to fit the adapter 40. The socket includes four internal, axially directed projections or teeth 72, four corresponding grooves 74, a relatively large cylindrical bore 76 dimensioned to accommodate the projections 52 of bayonet pin 50 with ample play, and a smaller terminal bore 78 to receive, and if desired to guide, the terminal portion 56 of the adapter. An abutment such as a cap screw 82 arranged at the bottom 84 of the terminal bore 78 is spaced from the axis of the mandrel holder so that it will project into the groove 60 of the adapter upon assembly of the parts. As shown in FIG. 3, the front face 86 of the mandrel holder has a linear mark 88 thereon, the mark being in alignment with the cap screw 82 and with one pair of opposite projections 72.

The mounting of mandrels is carried out with the stem 12 and mandrel holder 16 positioned generally as shown in FIG. 1 wherein the stem 12 is fully retracted but the mandrel holder 16 is in an advanced position relative to the stem, the front face 86 of the mandrel holder being adjacent to or flush with the free end of stem 12. Mandrel 18 and adapter 40, which with the aid of wrench flats 30 and 48 have been tightly screwed together outside of the press, will be positioned as shown in FIGS. 2 and 3 with the flats 48 and the linear mark 88 disposed parallel to each other. In this position, the projections 52 of the adapter register with grooves 74 of the socket 70 while the projections 72 of the socket register with grooves 54 of the adapter. Further, the abutment screws 62 are disposed to accommodate the abutment screw 82 therebetween. It will be clear that there are two positions of the adapter in which the flats 48 are parallel to the linear mark 88, and that either one of these positions may be selected for assembly. The adapter is then introduced in the socket and when it is fully inserted therein, the adapter and mandrel are turned clockwise, or anti-clockwise, through an angle of 45° (FIGS. 5 and 6). If desired, a wrench may be applied to the flats 30 for the turning movement. The size of the cap screws 62, 82 is such that the turn is completed when screw 82 is contacted by one of the screws 62 as shown in FIG. 6. Thus, the mandrel and adapter are securely locked against movement in the axial direction by virtue of the projections 52 being positioned behind the projections 72 in en-

gagement therewith. It will be clear from the drawings that the adapter is received substantially entirely within the openings of the mandrel and mandrel holder, whereby the outer surfaces of the assembly are generally smooth and unobstructed for effective guidance thereof in the press. Thus, the adapter **40** is substantially hidden by the mandrel **18** and its holder **16** so that the interior wall of the hollow stem **12** is protected from contact with the adapter which is made from relatively easily machinable material.

Extrusion is carried out in the conventional manner. The mandrel holder and mandrel are first withdrawn in the hollow stem **12** to introduce a billet **92** and an annular dummy block **94** in the press, and the parts are then advanced to load the billet and dummy block in the container **20**. Mandrel **18** is moved forward through the annular dummy block **94** (see FIG. 5) and will cooperate with the die assembly **24** to define an annular orifice therewith. When stem **12** and dummy block **94** exert pressure upon the billet **92**, the metal will be extruded in the form of a tube.

To remove a used mandrel **18**, the parts are again positioned as shown in FIG. 1 and the mandrel and its adapter **40** are then turned as a unit through an angle of 45° from the FIG. 6 position back to the angular position shown in FIG. 3. Thereafter, the used mandrel and its adapter are simply withdrawn from the mandrel holder **16**, and a ready mandrel and adapter are inserted and locked therein. The used mandrel is separated from, and a new or cooled mandrel is tightly connected to, the adapter outside the press while the next extrusion cycle is carried out without loss of time.

It will be clear from the foregoing description that the mandrel proper which is normally made of a high grade steel is of the conventional simple shape and as short as possible. Thus, the cost of this expendable part is kept to a minimum. The more complicated shape required for the bayonet pin is incorporated in the adapter which may be made of a lower grade steel and may be used with a large number of mandrels in rotation so that only a few adapters will be required. In this way, the advantages of the rapidly connectable and disconnectable bayonet joint are obtained in a very economical manner. As the separation of mandrels and adapters takes place outside of the machine, it will not affect the production.

Proper guidance of the mandrel relative to the adapter is insured by means of the counterbore **34** in the mandrel in conjunction with the closely fitting guide portion **44** of the adapter. As indicated hereinbefore, the terminal portion **56** of the adapter and the terminal bore **78** in the mandrel holder may likewise fit each other closely to center the adapter and mandrel relative to the holder. This will be of advantage, for example, when using the mandrel to piece the billet and extrude the latter in one continuous operation. If, however, the mandrel is inserted in a hollow billet after formation of the hole and serves exclusively to form an annular extrusion orifice with the die, it will be desirable to provide for some play of the adapter in the mandrel holder as the metal flowing through the extrusion orifice will tend to center the mandrel and adapter properly.

The circular groove provided in the terminal face of the bayonet pin is easy to machine, and it is simple to provide two opposite abutments such as screws therein. This is less expensive than the milling of an arc-shaped slot, for example. Moreover, it provides for insertion of the mandrel and adapter in the bayonet socket in two alternative positions, which assists in facilitating the assembly of the parts. After insertion in the holder, the mandrel and its adapter may be turned in either direction until proper locking takes place.

While a preferred embodiment of the invention has been described, it will be understood that various modifications and changes may be made without departing from the scope of the invention as defined in the appended claims.

Having described our invention, what we claim and desire to secure by Letters Patent is:

1. A tool assembly for a metal extrusion press, comprising a hollow, pressure applying stem; a mandrel having a metal engaging front end and a rear end carrying internal threads; a generally plug-shaped adapter consisting of relatively easily machinable material and including an externally threaded end for engaging said threads of the mandrel, and a bayonet end having a plurality of external grooves and projections extending parallel to the axis of said generally plug-shaped adapter, the terminal face of said bayonet end being provided with a circular groove; a pair of spaced abutments positioned in said circular groove and secured to said adapter; a mandrel holder movable within said hollow stem and having a bayonet socket provided with axially extending grooves and projections to accommodate said bayonet end of the adapter; and an abutment secured to the bottom of said bayonet socket, the last-named abutment being arranged to protrude into said circular groove of the adapter so as to be engaged by one of the abutments of the adapter when said projections of the adapter and mandrel holder are in alignment with each other to lock the adapter in said holder, said adapter when in operative position being received substantially entirely within said internally threaded rear end of the mandrel and said bayonet socket of the mandrel holder, whereby the interior wall of said hollow stem is protected from contact with said adapter.

2. A tool assembly for a metal extrusion press, comprising a hollow, pressure applying stem; a mandrel having a metal engaging front end and a rear end, said rear-end being provided with a threaded bore therein and a counterbore at the end of said threaded bore; a generally plug-shaped adapter consisting of relatively easily machinable material; said adapter including an externally threaded portion at one of its ends for engaging said threaded bore of the mandrel, a cylindrical guide portion adjacent said externally threaded portion for engaging said counterbore of the mandrel, a bayonet pin portion connected to said guide portion and having a plurality of grooves and projections extending parallel to the axis of said generally plug-shaped adapter, and a terminal portion adjacent said bayonet pin portion; and a mandrel holder movable within said hollow stem; said mandrel holder having an opening in the form of a bayonet socket fitting said bayonet pin portion of the adapter, a terminal bore portion being provided at the inner end of said opening for engaging said terminal portion of the adapter, said adapter being received in its operative position substantially entirely within said bore and counterbore of the mandrel and said opening of the mandrel holder, whereby the internal wall of said hollow stem is protected from contact with said adapter.

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