

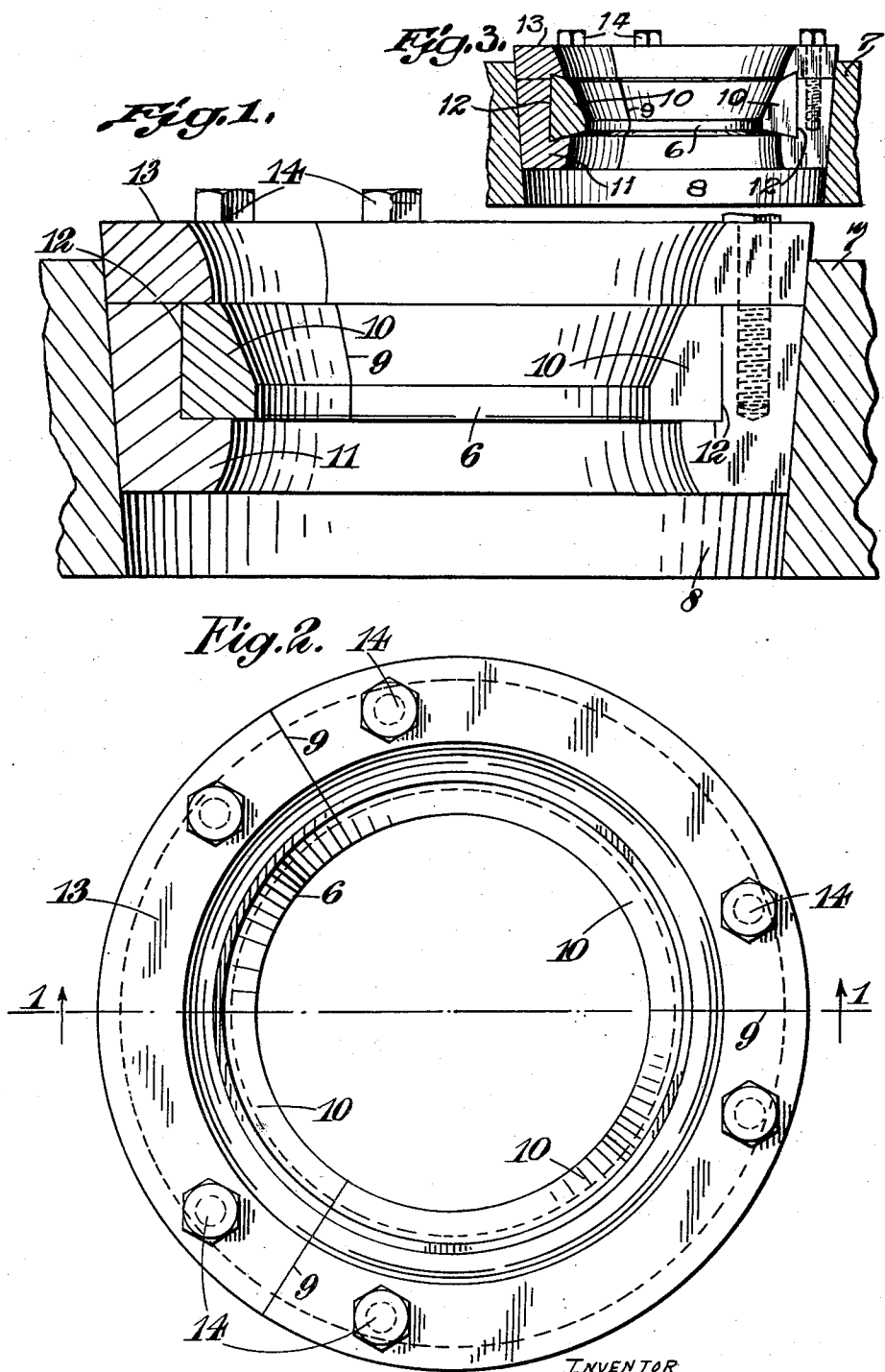
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PUSH BENCH TUBE DIE

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PUSH BENCH TUBE DIE

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This invention relates to dies for use in the cupping or push bench process of making metal tubes, its object being to provide improvements in the construction of the dies with a view to prolonging their working life.

In the cupping or push bench process referred to above of making metal tubes a partially pierced heated billet is placed on the end of a mandrel and forced through a die or, especially in the case of the smaller tubes, through a succession of co-axially disposed dies. Although divided dies are known in other methods of making tubes, in this cupping or push bench process each die has heretofore been provided in the form of a ring having a flared opening to guide the billet to the operative drawing surface and the die is supported in an annular holder usually mounted across a suitable channel. The exterior surface of the die and the interior surface of the holder are usually slightly bevelled or coned in order that the die may be automatically held in axial alignment with the mandrel under the pressure exerted in the process. If, as sometimes happens, the billet is torn asunder leaving a portion of the partially extruded tube gripped by a die it becomes necessary to remove each of the dies gripping the tube-remnant from its holder and to break it before the tube can be freed, this removal and fracture of the dies being effected by a sledge hammer and taking place simultaneously when, as is usual, the dies are made of cast iron.

The present invention provides means for enabling such a tube remnant to be released without fracturing the dies which are gripping it, and also provides economical means for making the dies of the most suitable materials.

In the accompanying drawing:—

Figure 1 is a sectional plan of a die according to the present invention, the section being on the line 1—1 of Figure 2 which is an elevation of the die shown separately from its holder.

Figure 3 is a view similar to Figure 1 illustrating a modification.

Like reference numerals indicate like parts throughout the drawing.

In carrying out the present invention the die is divided radially and comprises separate bit sectors 10 on which the operative drawing surface 6 of the die is formed and the bit sectors 10 are fitted to carrier sectors 11.

The carrier sectors 11 are each formed with a groove 12 in its inner surface forming a continuous circular groove when the sectors are as-

sembled in annular formation and the bits 10 are held in the grooves 12 of the carriers.

Preferably, the carrier sectors 11 are divided transversely to the axis, this division being effected as shown in Figure 1 as a continuation of one side wall of the groove 12, thereby dividing each carrier sector into a main part 11 surrounding the bit sector 10 and a retaining part 13. The retaining part 13 is secured to the main part 11 by means of bolts or screws 14 and it will be understood that this construction provides a convenient method of fitting the bits 10 to the carrier sectors 11, 13.

The die is preferably made in three composite sectors and is supported in the operative position by the usual annular holder 7 which is generally mounted across a channel or trough, not illustrated. The exterior surfaces or perimeters of the carrier sectors 11, 13 are slightly coned as shown in Figure 1 to fit the correspondingly coned aperture 8 of the holder 7.

The complete die comprising the bits 10 and carrier sectors 11, 13 may be assembled in the holder 7 by grouping the sectors into an annular formation with their ends abutting at 9 (as shown in Figure 2) and holding them in a loop of suitable material such as a strip of metal and then inserting them into the holder 7 until they are gripped thereby when the loop may be removed.

It is preferred to make each of the bit sectors 10 of the same angle as its carrier sector 11, 13, so that the ends of both the bits and the carriers abut against one another at the same place as indicated at 9 in Figure 2 in order to enable the die to be moved axially along a tube remnant without fracturing either the die or the bits.

The die will operate in the usual manner, the junctions at 9 being sufficiently closely fitting to avoid scoring the tube which is being drawn. If the billet should be torn asunder the remnant held by one or more of the dies may be freed therefrom by simply tapping the carrier sectors 11 out of their holder 7. The die parts will then fall off the tube remnant which may be easily removed through the aperture 8 of the holder 7. Finally the die parts may be re-assembled and replaced in the holder 7 as described above so that not only is the operation of freeing the tube remnant facilitated, but the die is not destroyed in the process.

If desired an external flange may be formed on the retaining part 13 of each carrier sector to over-lap the face of the holder 7.

The side walls of the grooves 12 may be under-

cut and the corresponding parts of the bits 10 may be dovetailed to fit as illustrated in Figure 3. When the carrier sectors are made in two parts 11 and 13, and the division is situated at or between the side walls of the groove 12, it will be appreciated that each of the bit sectors 10 may easily be inserted between the two parts of its carrier sectors before the latter are secured together. If desired, however, each carrier may be provided as a single sector and in this case the bits 10 may be threaded into the ends of the grooves 12 when the latter are provided with undercut walls.

In all cases the aperture of the carrier sectors may be flared on both sides as shown in Figure 1.

The carrier sectors 11, 13 are preferably formed of mild steel whilst the bit sectors 10 may be made of any suitable steel or alloy. It is generally preferred to make the bits and carriers separately and to fit them into a complete annular die. If desired, however, the carriers may be provided as a complete integral ring which may be forged or cast with a continuous groove in its inner flared surface, and an endless bit 10 may be cast of any desired alloy in the groove by using a suitable mould inside the carrier ring. After the exterior of the ring and, if necessary, the contained bit, has been machined to shape, the composite die is divided by the desired number of radial cuts (which would be represented by the lines 9 in Figure 2) into a number of sectors each containing a bit which provides the operative drawing surface 6.

What I claim is:—

1. In a push bench tube die, the combination of carrier sectors grouped in annular formation to provide a complete ring and separate die bits shaped as ring sectors each fitted to and readily separable from a carrier sector of the same angle.

2. In a push bench tube die, the combination of carrier sectors, each formed with a groove in its inner surface, means for supporting the carriers in annular formation with their respective grooves forming one continuous circular groove, and die bits in the carrier grooves separated from one another on the same radial planes as the carrier sectors.

3. In a push bench tube die, the combination of carrier sectors grouped in annular formation to provide a complete ring and each divided transversely to the axis, means for securing the parts of each carrier sector together, and separate die bits held between the parts of the carrier sectors, each die bit being formed as a sector and associated with one of said carrier sectors, the associated carrier sectors and die bit sectors defining similar angles and being readily separable.

4. In a push bench tube die, the combination of carrier sectors each formed with a groove in its inner surface and divided transversely to the axis through the groove, means for securing the parts of each carrier sector together, means for supporting the carrier sectors in annular formation, and die bits in the carrier grooves separated from one another on the same radial planes as the carrier sectors.

5. In a push bench tube die, the combination of carrier sectors each formed with a groove in its inner surface having an undercut wall, and each divided transversely to the axis in a continuation of one wall of the groove therein, means for securing the parts of each carrier sector together, means for supporting the carriers in annular formation with their respective grooves forming one continuous undercut circular groove, and die bits with tapered sides fitting the carrier grooves and separated from one another on the same radial planes as the carrier sectors, substantially as specified.

6. In a push bench tube die, the combination with a holder having an axially tapered aperture, carrier sectors arranged in annular formation to provide a complete ring and having axially tapered peripheral surfaces conforming substantially to the aperture in the holder, and separate bits on which the operative drawing surface of each die is formed, each of said bits being fitted to and supported by one of said carrier sectors and being readily separable therefrom.

7. In a push bench tube die, the combination with a holder having an axially tapered aperture, carrier sectors arranged in annular formation and having axially tapered peripheral surfaces conforming substantially to the aperture in the holder, and separate bits on which the operative drawing surface of each die is formed, each of said bits being fitted and supported by one of said carrier sectors, each of said carrier sectors being formed in two sections separated transversely of the axis of the die, and means for connecting the sections of each sector to clamp the associated bit therebetween.

8. In a push bench tube die, the combination of carrier sectors, each formed with an undercut groove in its inner surface, means for supporting the carriers in annular formation with their respective grooves forming one continuous circular groove, and die bits with tapered sides fitting the carrier grooves and separated from one another on the same radial planes as the carrier sectors.

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