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2,373,844

PUNCH AND WORK LOCATING TEMPLATE

Filed Nov. 1, 1944

4 Sheets-Sheet 1

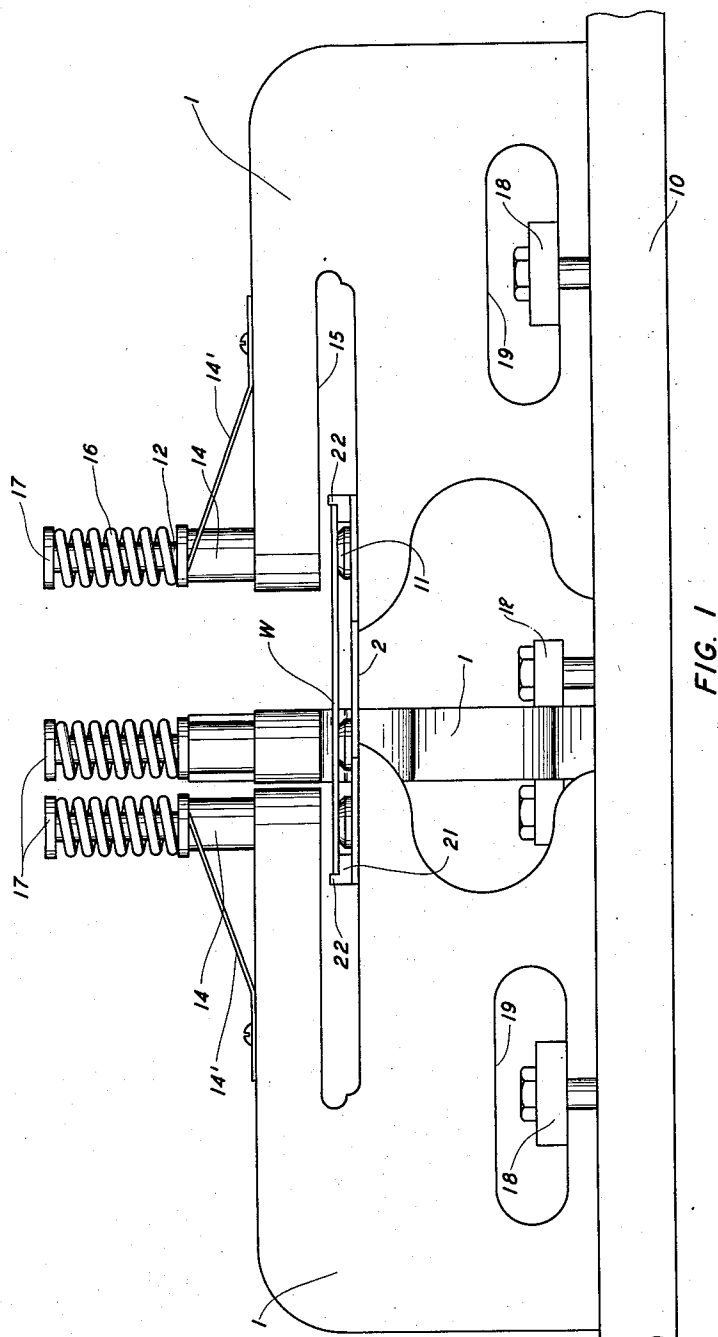


FIG. 1

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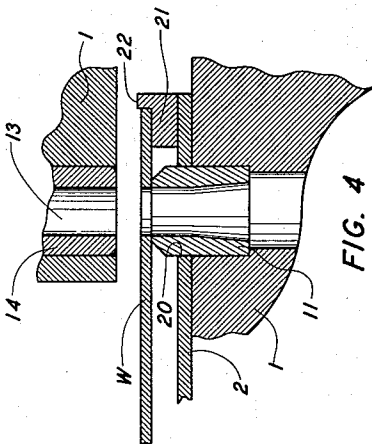
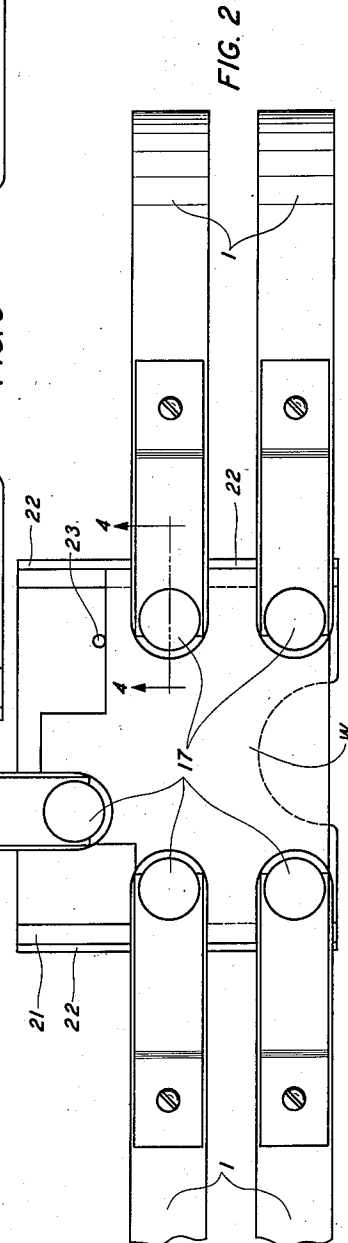
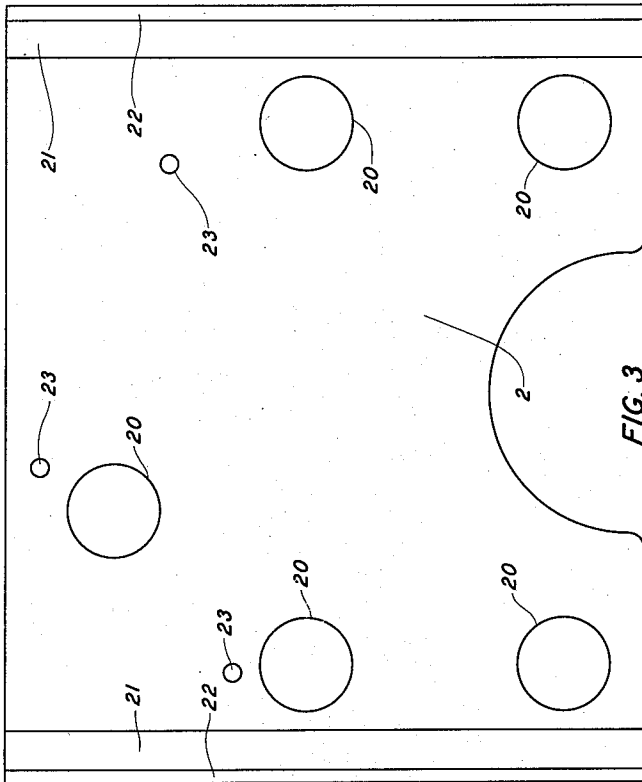
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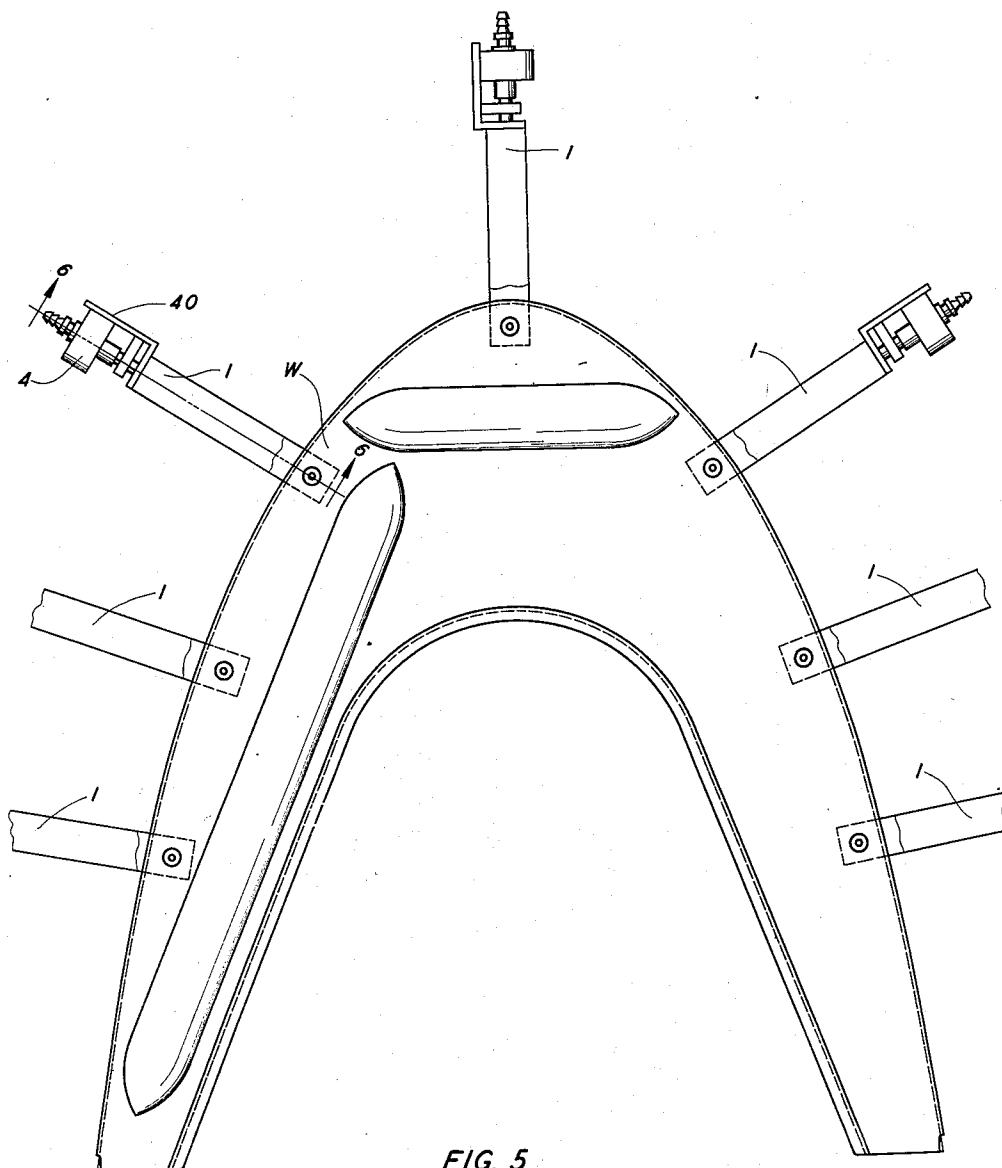
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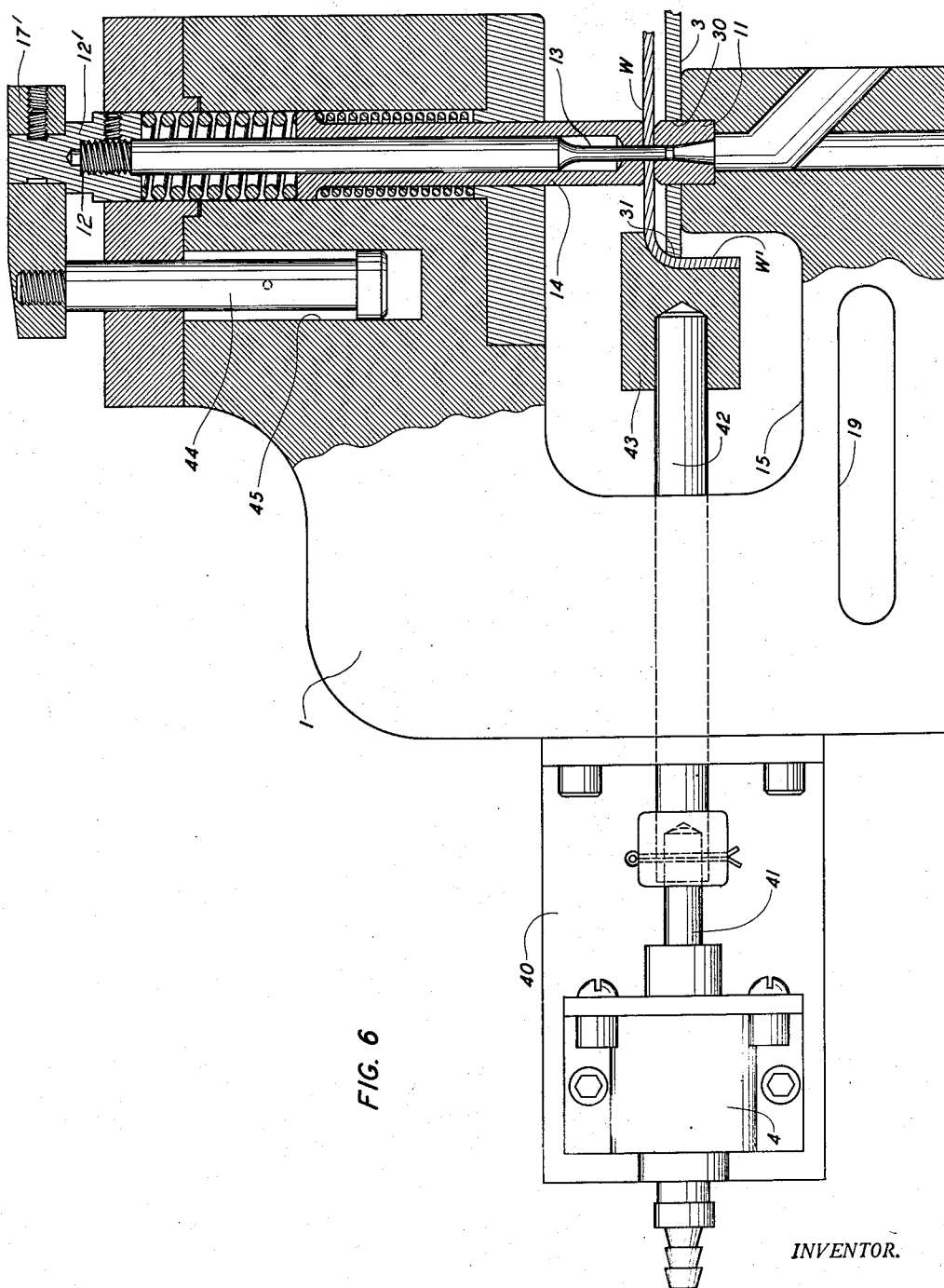
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PUNCH AND WORK LOCATING TEMPLATE

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4 Sheets-Sheet 4



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2,373,844

PUNCH AND WORK LOCATING TEMPLATE

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12 Claims. (Cl. 164-118)

In punching or otherwise working various local portions of a work sheet, such as one made of sheet metal, for example, it has become customary practice to employ several individual perforating or forming punch-and-die units located appropriately with relation to each other and operated by a single actuating device, such as a hydraulic press. In describing my invention it will be convenient to refer to the individual units which actually perform the work on the sheet as punch-and-die units, but it will be understood that each such unit may incorporate either male and female forming dies, such as for the purpose of producing a dent in the sheet, or, more frequently, a perforating punch and complementally apertured bolster for punching a hole through the work sheet.

Such individual punch-and-die units are customarily supported on the bed of a press, which may be of the hydraulic type, in positions such that they will be engaged by the press plunger to operate simultaneously on a work sheet. By such operation they will punch holes, or otherwise form the sheet, in the various locations desired, corresponding to the arrangement of the several punch-and-die units. In order to be able to process adjacent portions of a work sheet in a single operation the individual punch-and-die units mentioned above are made narrow. Usually they are comparatively quite high to accommodate the male die or punch and bolster mechanism. If the punch-and-die unit base is not exactly true, therefore, or if the press base is slightly irregular, such unit may tilt. Such tilting displaces the forming dies or punch and bolster. Consequently it has been difficult to locate the die members of several such individual units readily in the relative positions necessary to form or perforate the work sheet accurately in the various desired locations.

A principal object of my invention is to locate a plurality of individual punch-and-die units relative to each other so that the several formations or apertures produced by them in the work sheet will bear precisely the desired relationship to each other.

It is a further object to facilitate the operation of setting up initially a number of punch-and-die units on a press base, while at the same time establishing their location with accuracy.

More specifically it is an object to utilize a boss encircling a die of each punch-and-die unit, especially a projecting punch-opposing die bolster, as the element by which the unit is located with respect to the other punch-and-die units.

The most important object is to employ a single template for the dual purpose of locating the individual punch-and-die units and positioning the work sheet with respect to such units.

Templates embodying the principles of my in-

vention may vary considerably in shape and structure, depending largely upon the type of work sheet to be processed. Two typical installations are shown in the drawings as illustrative.

5 Figure 1 is a side elevational view of an assembly of perforating punch-and-die units, showing my template in operative relationship to them.

Figure 2 is a plan view of my template and the associated punch-and-die units shown in Figure 1.

10 Figure 3 is a plan view of the template.

Figure 4 is a fragmentary transverse sectional view through a portion of a punch-and-die unit on which the template is fitted, taken on line 4-4 of Figure 2.

15 Figure 5 is a plan view of a different type of template and punch-and-die unit assembly, showing portions of the units broken away. Figure 6 is a side elevation view of one of the punch-and-die units shown in Figure 5, with portions in section and a major portion of the work sheet and template broken away.

Although my template is suitable for use in conjunction with various kinds of individual punch-and-die units, it may advantageously be employed with a plurality of perforating punch-and-die units of the general type disclosed in Wales Patent No. 1,955,866, issued April 24, 1934, for example. Such units should be constructed so that a die, and preferably the punch-opposing die bolster, has a reference surface adapted to cooperate with a complementary portion of the template. Conveniently each bolster may take the form of a cylindrical boss of a size to fit snugly within an aperture provided in the template. The template, being thus located adjacent to a die element of the punch-and-die unit which actually engages the work piece, usually a sheet, may also incorporate elements engageable with the work piece for locating it in precisely the correct relationship with respect to the punches and dies of the several punch-and-die units positioned by the template.

With the general functions of my template thus in mind attention may be directed to the typical assembly for punching a number of holes in the plate shown in Figures 1 to 4 inclusive. The individual punch-and-die units have body blocks 1 which are quite thin, and consequently their bases resting upon the base 10 of a hydraulic press or the like are narrow. For that reason the punch-and-die unit, which is relatively high, may tilt rather easily to displace the bolster 11 relative to the other punch-and-die units transversely of the press stroke. A plunger 12 carrying the punch 13 is slidably received in a guide and stripper sleeve 14, which in turn is slidable vertically in the portion of the punch body 1 above its throat 15. The plunger 12 is normally held in its upper position by a spring 16 reacting between the

stripper sleeve 14 and the head 17 on the plunger, while such sleeve is lifted by leaf spring 14' having one end engaged with the sleeve and the other secured to the top of the punch body.

As mentioned previously, it is preferred that the bolster 11 of each punch-and-die unit project upward above the body a reasonable distance to provide a locating surface for engagement with the template 2. As shown best in Figures 3 and 4, this surface may be cylindrical for insertion in holes 20 formed in the template, of a size to fit the cylindrical bolster boss snugly. As shown in Figure 3 the several holes will be distributed over the template 2 in a pattern corresponding to the desired arrangement of the holes in the work sheet.

During the operation of inserting the template edgewise into the throat of each punch-and-die unit body to fit the several apertures 20 over the respective bolsters 11, the units will, of course, be freely slidable over the press base 10. After the template has thus been engaged with the bolsters each punch-and-die unit can be swung as may be necessary to locate its body approximately perpendicular to a side edge of the template. This relationship is not necessary, but it facilitates anchoring the several punch-and-die units after they have been located by the template, and also is usually most convenient for handling the work during the punching operation. When the units have thus been located they may be secured in place in conventional manner, such as by anchor bars 18 extending through apertures 19 in the unit bases and bolted to the press base 10.

When the assembly of the several punch-and-die units and the template has been completed the engagement of the template with the punch-opposing dies adjacent to the work sheet will insure that the holes will be punched, or other work performed on the sheet, in precisely the proper interrelationship. To insure that the work sheet will be processed accurately in every respect, therefore, it is merely necessary to locate it in exactly the proper disposition relative to the grouped punch-and-die units. This result can be achieved by locating the work sheet with the same template 2 which positions the punch-and-die units.

As shown in Figs. 1 to 3, inclusive, locating surfaces are provided in the form of marginal bars 21 each having an upper surface of angle shape. These bars are mounted on the template to form supporting strips for opposite marginal portions of the work sheet and flanges 22 projecting upward above the tops of bolsters 11 for engagement by opposite edges of a work sheet W. In addition locating pins 23 may be secured to the template in position for engaging one edge of the work sheet joining the edges engageable with flanges 22. Figure 1 shows the manner in which the work sheet engages these flanges, whereas Figure 2 shows another edge of the work sheet pushed against a locating pin 23. When the work sheet is thus located the press can be closed to engage the heads 17 of all the punch units for actuating such units simultaneously.

The punch-and-die unit and template assembly shown in Figures 5 and 6 is similar to that described, but incorporates a template 3 of different shape, and having a different arrangement for locating the work sheet. In this instance the work is represented as being the leading edge portion of an airplane wing rib. The parts of the punch-and-die units are numbered

to correspond with the numbering of those shown in Figures 1 to 4, inclusive. The template 3 has apertures 30 in the desired locations, which are of a size to fit snugly over the projecting cylindrical portions of bolster 11. When properly located each punch-and-die unit may be held in place by a bar secured to the press base in the manner described in connection with the assembly of Fig. 1, but this is not necessary and such bars have not been shown in this instance, to avoid confusion. The template 3 does not have an upwardly projecting work locating surface, but its edge 31 is formed with a slight bevel for engagement with the curve joining the flange W' of the work sheet to its body portion.

Where the work is of simple shape it may be held on the template manually, or perhaps need not be held at all. It may be desirable to hold more complicated pieces mechanically. A clamping arrangement for this purpose, shown in Figures 5 and 6, includes an air cylinder 4, having at the left as seen in the latter figure a conventional air hose connection, and mounted on a bracket 40 which is secured to the body 1 of the punch-and-die unit. The piston rod 41 is secured to a plunger 42 extending through an aperture in the portion of the body forming the throat of the unit, and guided for reciprocation by such aperture. The inner end of the plunger 42 carries a block 43 shaped complementally to the work so that it not only presses the work against the edge of the template upon movement of piston rod 41 outward from its cylinder 4, but also wedges the work sheet downward against the bolster 11 of each punch-and-die unit.

Particularly if the punch-and-die unit is to perform a forming operation it may be desirable to provide a guide rod for the punch plunger. Such a rod 44 is shown in Fig. 6 as having a head 45 sliding in a cavity 45 formed in the body 1 of the unit. The plunger 12 in this instance may have an enlarged portion 12' secured upon or formed integral with its upper end. As illustrated, such portion takes the form of a cap screwed onto the plunger stem, its upper end being reduced to form a boss fitting within an aperture of the plunger head 17' and shouldered beneath such head to receive the thrust applied to the head. The plunger head 17' is shaped as a bar having an aperture in one end receiving the boss of cap 12', as stated, and an aperture in its opposite end in which the upper end of guide rod 44 is received. The guiding features described and the structure of the return spring assembly for plunger 12 are not part of the instant invention.

I claim as my invention:

1. Punch-and-die mechanism comprising a plurality of individual punch-and-die units adapted to be grouped on the bed of a press for simultaneous actuation by such press, each punch-and-die unit having a reference surface adjacent to the work-engaging end of a die element thereof, and a template engaging simultaneously the said reference surface of each of said punch-and-die units for locating the coacting die elements of each punch-and-die unit accurately relative to the coacting die elements of the other punch-and-die units.

2. Punch-and-die mechanism comprising a plurality of individual punch-and-die units adapted to be grouped on the bed of a press for simultaneous actuation by such press, each punch-and-die unit having a reference surface adjacent to the work-engaging end of a die ele-

ment thereof, and a template engaging simultaneously such a reference surface of each of said punch-and-die units for locating the coacting die elements of each punch-and-die unit accurately relative to the coacting die elements of the other punch-and-die units, said template having locating means engageable by a work piece for positioning such work piece with respect to the coacting die elements of the punch-and-die units located by said template.

3. Mechanism as defined in claim 2, and clamping means carried by one of the punch-and-die units and operable to press the work piece against a reference surface of the template.

4. Punch-and-die mechanism comprising a plurality of individual punch-and-die units adapted to be grouped on the bed of a press for simultaneous actuation by such press, each punch-and-die unit having a boss encircling the work-engaging end of a die element thereof, and a template formed to embrace simultaneously said boss of each of said punch-and-die units for locating the coacting die elements of each punch-and-die unit accurately relative to the coacting die elements of the other punch-and-die units.

5. Punch and die mechanism comprising a plurality of individual punch-and-die units adapted to be grouped on the bed of a press for simultaneous actuation by such press, each punch-and-die unit including a punch-opposing bolster boss having a cylindrical external surface, and a template having apertures therein each fitted snugly over the cylindrical bolster boss of a punch-and-die unit for locating the punch and punch-opposing die of each such unit accurately relative to the punches and punch-opposing dies of the other punch-and-die units.

6. Punch-and-die mechanism comprising a plurality of individual punch-and-die units adapted to be grouped on the bed of a press for simultaneous actuation by such press, each punch-and-die unit including a punch-opposing bolster boss having a cylindrical external surface, a template having apertures therein each fitted snugly over the cylindrical bolster boss of a punch-and-die unit for locating the punch and punch-opposing die of each such unit accurately relative to the punches and punch-opposing dies of the other punch-and-die units, the edge of said template constituting a locating surface, and clamping means including a plunger reciprocable toward said template edge and engageable with a work sheet extending downward over such template edge to press the work sheet thereagainst for positioning such work sheet with respect to the bolster bosses of the punch-and-die units located by said template.

7. Punch-and-die mechanism comprising a plurality of individual punch-and-die units adapted to be grouped on the bed of a press for simultaneous actuation by such press, each punch-and-die unit including a punch-opposing bolster boss having a cylindrical external surface, a template having apertures therein each fitted snugly over the cylindrical bolster boss of a punch-and-die unit for locating the punch and punch-opposing die of each such unit accurately relative to the punches and punch-opposing dies of the other punch-and-die units, and work locating means carried by said template and projecting upward therefrom to a location above the tops of said bolster bosses, engageable by a work piece for positioning such work piece

with respect to the coacting die elements of the punch-and-die units located by said template.

8. Punch-and-die mechanism comprising a plurality of individual punch-and-die units adapted to be grouped on the bed of a press for simultaneous actuation by such press, each punch-and-die unit including a punch-opposing bolster boss having a cylindrical external surface, a template having apertures therein each fitted snugly over the cylindrical bolster boss of a punch-and-die unit for locating the punch and punch-opposing die of each such unit accurately relative to the punches and punch-opposing dies of the other punch-and-die units, and a bar secured to said template at one side of the group of punch-and-die units and forming a flange projecting upward above the tops of said bolster bosses engageable by the edge of a planar work sheet resting on said bosses for positioning such work sheet with respect to the coacting die elements of the punch-and-die units located by said template.

9. Punch-and-die mechanism comprising a plurality of individual punch-and-die units adapted to be grouped on the bed of a press for simultaneous actuation by such press, each punch-and-die unit including a punch-opposing bolster boss having a cylindrical external surface, a template having apertures therein each fitted snugly over the cylindrical bolster boss of a punch-and-die unit for locating the punch and punch-opposing die of each such unit accurately relative to the punches and punch-opposing dies of the other punch and die units, and two bars secured to said template at opposite sides of the group of punch-and-die units and forming supporting strips for opposite marginal portions of a work sheet, said template also having flanges projecting upward above the tops of said bolster bosses engageable by opposite edges of a work sheet resting on said bars for positioning such work sheet with respect to the coacting die elements of the punch-and-die units located by said template.

10. Punch-and-die mechanism comprising a punch-and-die unit having a boss encircling the work-engaging end of a die element thereof, and a locating member formed to embrace said boss, and engageable by a work piece for positioning such work piece accurately with respect to the coacting die elements of the punch-and-die unit.

11. Punch-and-die mechanism comprising a punch-and-die unit including a punch-opposing bolster boss having a cylindrical external surface, a locating plate apertured to embrace said boss, and means carried by said plate and engageable by a work piece for positioning such work piece accurately with respect to the coacting punch and die elements of the punch-and-die unit.

12. Punch-and-die mechanism comprising a punch-and-die unit having a reference surface adjacent to the work-engaging end of a die element thereof, locating means simultaneously engaging said reference surface and engageable by a work piece for positioning such work piece with respect to the coacting die elements of the punch-and-die unit, and clamping means carried by said punch-and-die unit and operable to press the work piece against a reference surface of said locating means.

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