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[31]		35925/68

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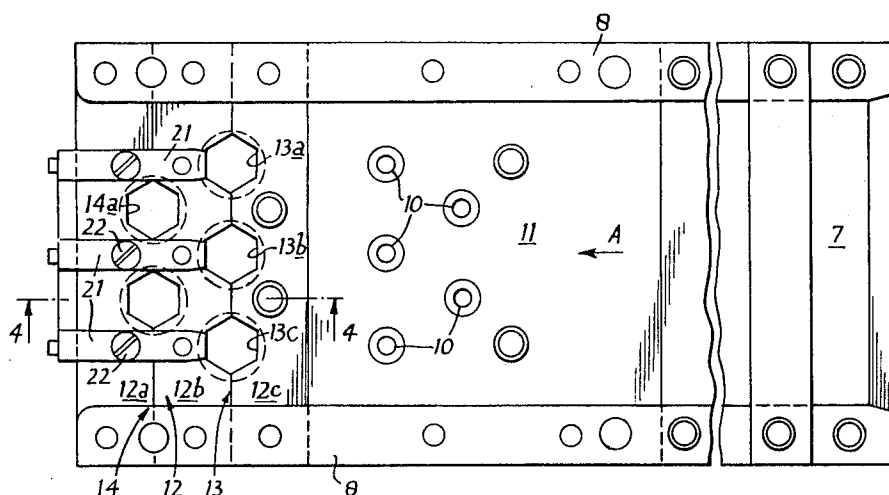
[54] **MANUFACTURE OF HEXAGONAL SLUGS**
10 Claims, 4 Drawing Figs.

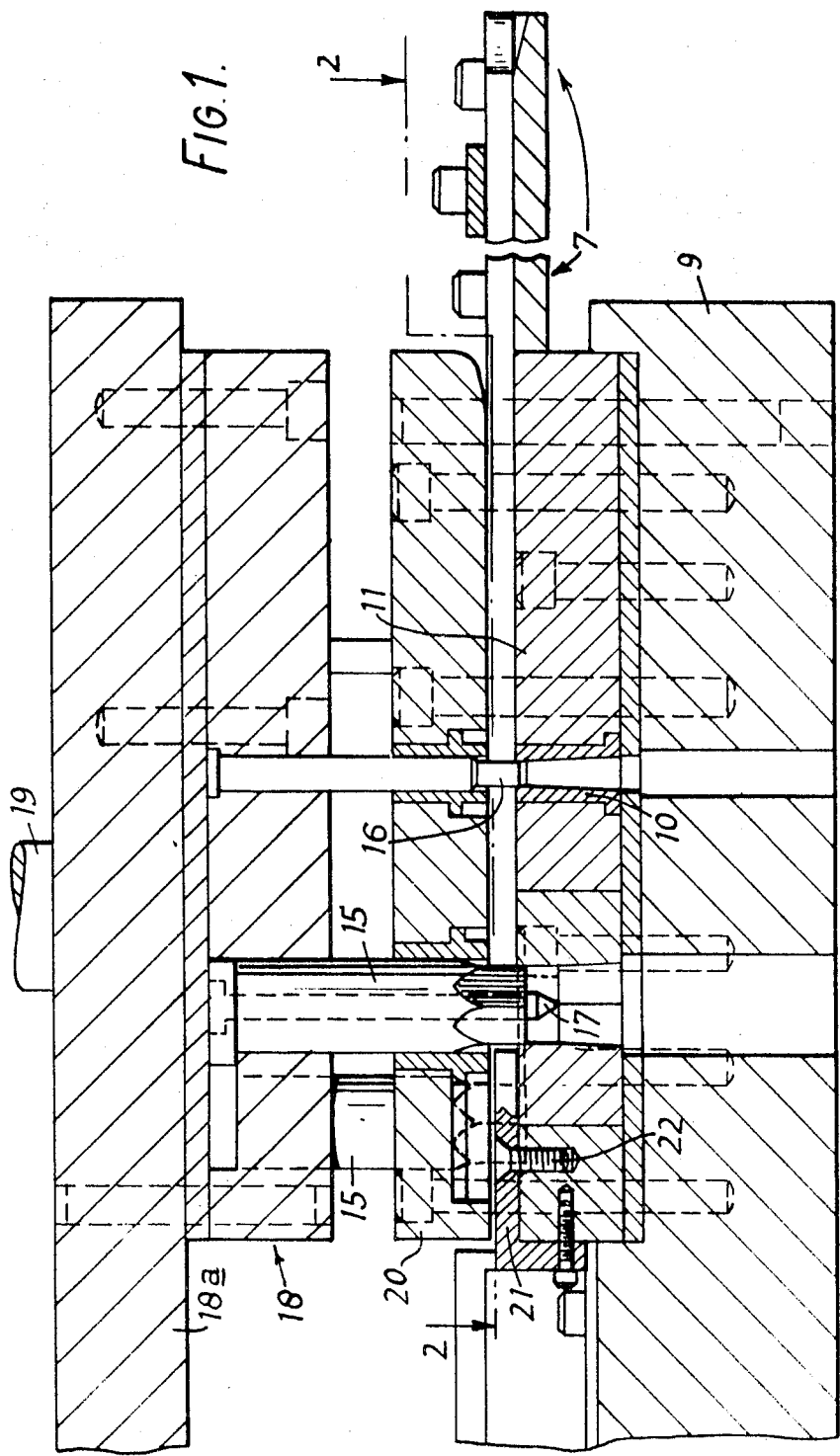
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[51] **Int. Cl.**..... **B26f 1/02**

[50] **Field of Search**..... **83/32, 40,**
42, 43, 48, 50, 237, 255, 268, 467, 449; 10/72, 86

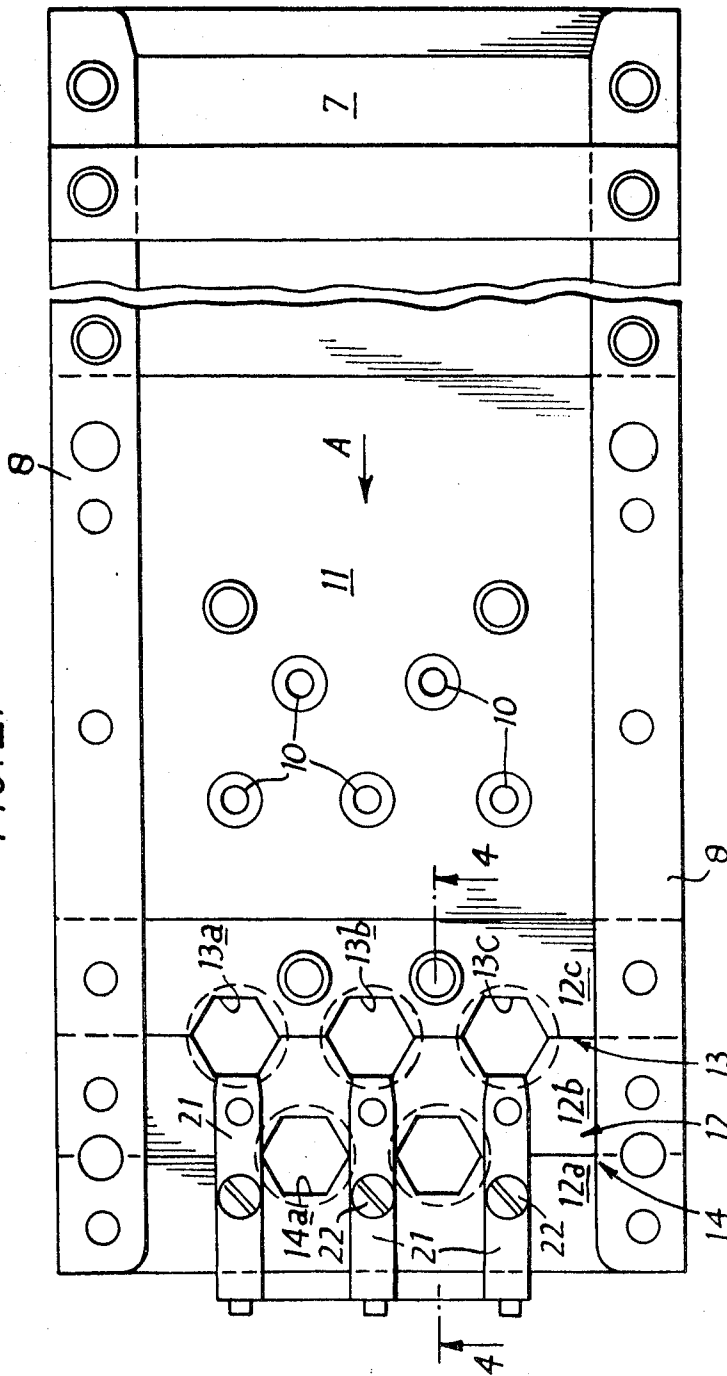
ABSTRACT: Hexagonal slugs are cut from a strip or sheet of metal by feeding the strip or sheet step by step between punches and dies which are arranged in two lines across the strip or sheet. The punches and dies in the second line are staggered midway between those in the first line, and the whole of the strip or sheet between the sidemost punches is cut without waste into slugs. Yielding support for the strip is preferably provided within the dies of the second line, preferably by making these dies retain one or more slugs within them.



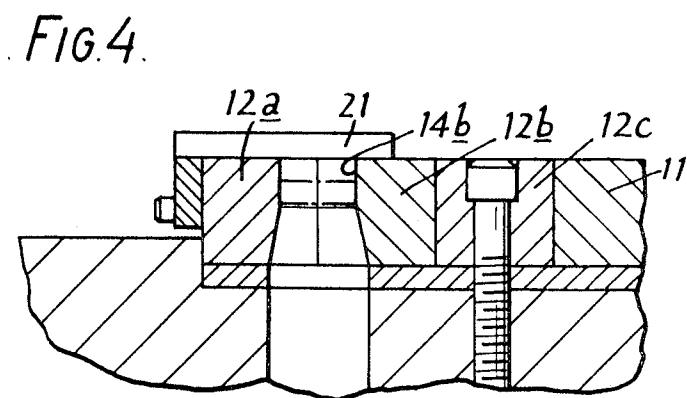
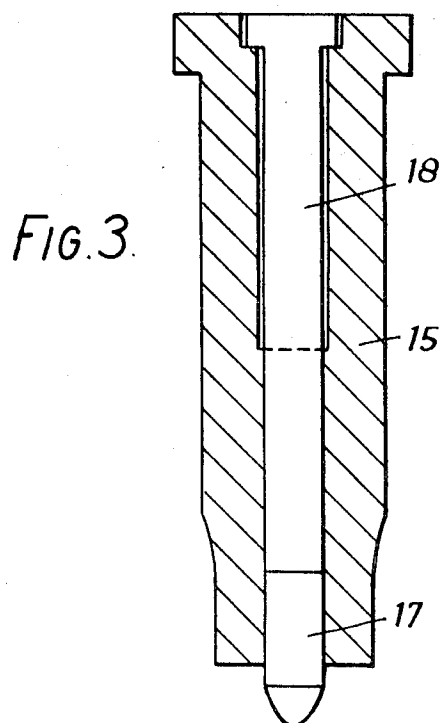


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FIG. 2.



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MANUFACTURE OF HEXAGONAL SLUGS

This invention relates to the manufacture of hexagonal slugs from a strip or sheet of metal, for example aluminum. Such slugs may be required for producing cylindrical impact extrusions and have the advantage over circular slugs of reducing the amount of scrap.

According to this invention in one aspect there is provided a method of punching hexagonal slugs from a strip or sheet successively through a first and a second line of hexagonal punches and dies, the punches and dies in the second line being staggered midway between those in the first line to cut the whole of the strip or sheet between the sidemost punches and dies without waste into hexagonal slugs, reciprocating the punches into and out of the dies in timed relationship with the step-by-step feeding movement of the strip, the punches in the second line being moved during such reciprocation to a forward limiting position in which the front face of each punch is substantially at that face of the die against which the strip or sheet is disposed, and yieldingly supporting the slug being produced in each die of the second line within such die during the punching of the slug. According to this invention, in another aspect there is provided apparatus for producing hexagonal slugs from a strip or sheet comprising a first and a second line of hexagonal dies, the dies in the second line being staggered midway between the dies in the first line, punches aligned with the respective dies, means for feeding the strip or sheet step by step across the first line of dies and then across the second line of dies, means for reciprocating the punches to punch the slugs from the strip or sheet, each punch in the second line having a front face which is moved by the reciprocating means into a rearward position and into a limiting forward position in which the front face of the punch is substantially at that end of the associated die nearer the strip or sheet, and means adapted to provide within each die of the second line a yielding support for the slug being produced in that die.

The support within each die may conveniently comprise one or more of the slugs cut by that die in the immediate preceding punching operations respectively, the upper surface of the uppermost of these slugs being initially level with the top of the die. A sprung platform could be provided as an alternative, but the above arrangement is preferred.

The invention also extends to slugs when produced by a method or apparatus as set forth in the second and third paragraphs of this statement.

One embodiment of the invention will now be described by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a sectional elevation of the apparatus,

FIG. 2 is a plan of a die member and die holder viewed on line 2—2 of FIG. 1,

FIG. 3 is a sectional view of a punch of the apparatus, including a pilot, and

FIG. 4 is a sectional view of a die on the line 4—4 of FIG. 2.

The apparatus illustrated is intended to punch hexagonal slugs from a strip of aluminum sheet which is moved through the apparatus. Each slug has a central hole, and the slugs are intended to be used for producing cylindrical impact extrusions. The holes are first punched in the strip at the appropriate locations, and the hexagonal slugs are then punched out.

Referring to FIGS. 1 and 2 of the drawings, circular dies 10 for the punching of the circular holes are secured in a dieholder 11 secured next to a die member 12 in a recess in a base member 9. The base member 9 has sidepieces 8 secured thereon to form a guide channel along which the strip is fed. An extension of the guide channel is shown at 7. The die member 12 is split into three parts 12a, 12b and 12c in a direction at right angles to the direction of movement of the strip indicated by arrow A, and provides the hexagonal dies, of which there are five in this instance and which are arranged in first and second lines 13, 14 as shown in FIG. 2, the two dies 14a, 14b in the second line 14 being staggered midway

between the dies 13a, 13b, 13c in the first line 13. It will be seen that the spacing between the first and second lines of dies is such that when the strip is advanced in the direction of the arrow A in steps equal to the distance between the flats of the hexagon, and punches disposed over the dies are operated at each step, the whole width of the strip between the two outermost dies will be cut without waste into hexagonal slugs.

Five hexagonal punches 15 arranged to cooperate with the respective hexagonal dies, five circular punches 16 to cooperate with the five circular dies are all mounted on an assembly 18 including a stout plate 18a which is secured to the lower end of a shaft 19 for vertical reciprocating movement. The punches and locating rods extend through a stripper plate 20 which overlies the die member 12 and dieholder 11 and which in operation of the apparatus rests on top of the strip. Pilot elements 17 are secured in the three hexagonal punches 15 of the first line 13 as shown in FIG. 3. These elements are solidly backed by bolts 18, but in a modified construction the elements 17 are backed by springs to enable them to retract into the punches. The elements 17 engage for locating purposes in the holes punched in a previous punching stroke by the circular punches 16 aligned with these rods in the direction of travel A.

Three fingerlike stops 21 are secured by screws 22 to the top and end faces of die member 12 and extend as shown in FIG. 2 up to the edge of the dies in the first line 13. The stops flank opposite sides of the dies in the second line 14 and assist in guiding the end of the strip.

It will be understood that the punches and dies in the second line 14 have each to shear the strip along only one edge (the trailing edge) of the hexagon to form a slug. In order to prevent these parts of the strip from tilting in the dies 14a, 14b during the punching operation, each of these dies has a depth and cross-sectional dimensions such as to retain the two slugs which were cut therein during the two preceding punching operations. During the punching operations, the punches of the second line reach a forward position substantially flush with the top faces of the dies and thus, the top surface of the uppermost of these two slugs is substantially level with the top edge of the die at the commencement of a punching operation and forms a yielding support which prevents the tilting of the slug during punching owing to the resistance to downward movement presented by the two slugs. This prevention of tilting during the punching operation results in a more accurate slug, particularly in comparison with engagement in which the slugs in the second row are formed by a simple guillotine type of operation.

In the construction illustrated, see FIG. 4, each of the dies 14a, 14b in the second row 14 is parallel sided for a distance equal to about twice the thickness of the strip from its end adjacent the punch so that two slugs indicated in chain lines are always retained in each of these dies. Below the parallel-sided portion, the die is divergent to free the slugs. In other cases, however, dependent on the dimensions of the slug and its proportions, the material from which it is made and other factors, it may be sufficient for the die to hold a single slug, the die being parallel sided along, said, the full height of this slug, or on the other hand it may be necessary for three or more slugs to be retained in each of these dies.

When the slugs are not required to have a central hole, the circular punches 16 are removed from the assembly 18 and either the pilot elements 17 are removed from the hexagonal punches 15 or punches 15 are replaced by pilotless punches.

In another arrangement, not illustrated, the pilot elements are mounted in the assembly 18 between the punches 16 and the hexagonal punches 15 in the first row 13, and extend through the stripper plate 20 into corresponding dielike inserts in the insert member 11 so as to locate in holes punched at the previous stroke by the line of three punches 16.

In another modification of the illustrated arrangement, the stop arrangement may include, between the fingerlike stops 21, intermediate portions which fit snugly against the three flats forming the forward face of each of the parts of the strip

underlying the punches 15 of the second row 14, so that the stop arrangement also locates the end part of the strip accurately in a transverse direction.

We claim:

1. A method of punching hexagonal slugs from a strip or sheet which method comprises feeding the strip or sheet step by step successively through a first and a second line of hexagonal punches and dies, the punches and dies in the second line being staggered midway between those in the first line to cut the whole of the strip or sheet between the sidemost punches and dies without waste into hexagonal slugs, reciprocating the punches into and out of the dies in timed relationship with the step-by-step feeding movement of the strip, the punches in the second line being moved during such reciprocation to a forward position in which the front face of each punch is substantially at that end of the die against which the strip or sheet is disposed, and yieldingly supporting the slug being produced in each die of the second line within such die during the punching of the slug.

2. Apparatus for producing hexagonal slugs from a strip or sheet comprising a first and a second line of hexagonal dies, the dies in the second line being staggered midway between the dies in the first line, punches aligned with the respective dies, means for feeding the strip or sheet step by step across the first line of dies and then across the second line of dies, means for reciprocating the punches to punch the slugs from the strip or sheet, each punch in the second line having a front face which is moved by the reciprocating means into a rearward position and into a limiting forward position in which the front face of the punch is substantially at that end of the associated die nearer the strip or sheet, and means adapted to provide within each die of the second line a yielding support for a slug being produced in that die.

3. A method as claimed in claim 1, wherein each die of the

second line is adapted to retain one or more of the slugs respectively cut in the preceding operations of the punch associated with that die thereby to support yieldingly the next slug to be produced in the die.

4. Apparatus as claimed in claim 2 wherein each die of the second line is adapted to retain one or more of the slugs respectively cut in the preceding operations of the punch associated with that die thereby to support yieldingly the next slug to be produced in the die.

5. Apparatus as claimed in claim 2 further comprising punches arranged to punch holes in the strip or sheet, before it reaches the hexagonal punches, in such manner that each hexagonal strip has a central hole therethrough.

6. Apparatus as claimed in claim 5, wherein means is provided for engaging one or more of said holes during a punching operation for locating the strip or sheet.

7. Apparatus as claimed in claim 6, wherein the hole-engaging means comprises a forwardly projecting element on the forward end of at least one of the hexagonal punches in the first row.

8. Apparatus as claimed in claim 2, wherein guide means is provided for engaging the lateral limits of the parts of the strip or sheet advancing from the first to the second line of dies.

9. Apparatus as claimed in claim 8, wherein the guide means includes guide elements for engaging the lateral limits of the part of the strip or sheet disposed over each die in the second line.

10. Apparatus as claimed in claim 2, wherein stop means is provided which is adapted to receive snugly in abutment those surfaces of the parts of the strip or sheet disposed over the second line of dies which have a forwardly facing component relative to the direction of feed of the strip or sheet.