May 15, 1962 F. A. BRANDES, JR. 3,034,466

METHOD AND BLANK FOR PROGRESSIVE DIE SHAPING OF SHEET-LIKE STOCK

Filed Dec. 19, 1957 2 Sheets-Sheet 1

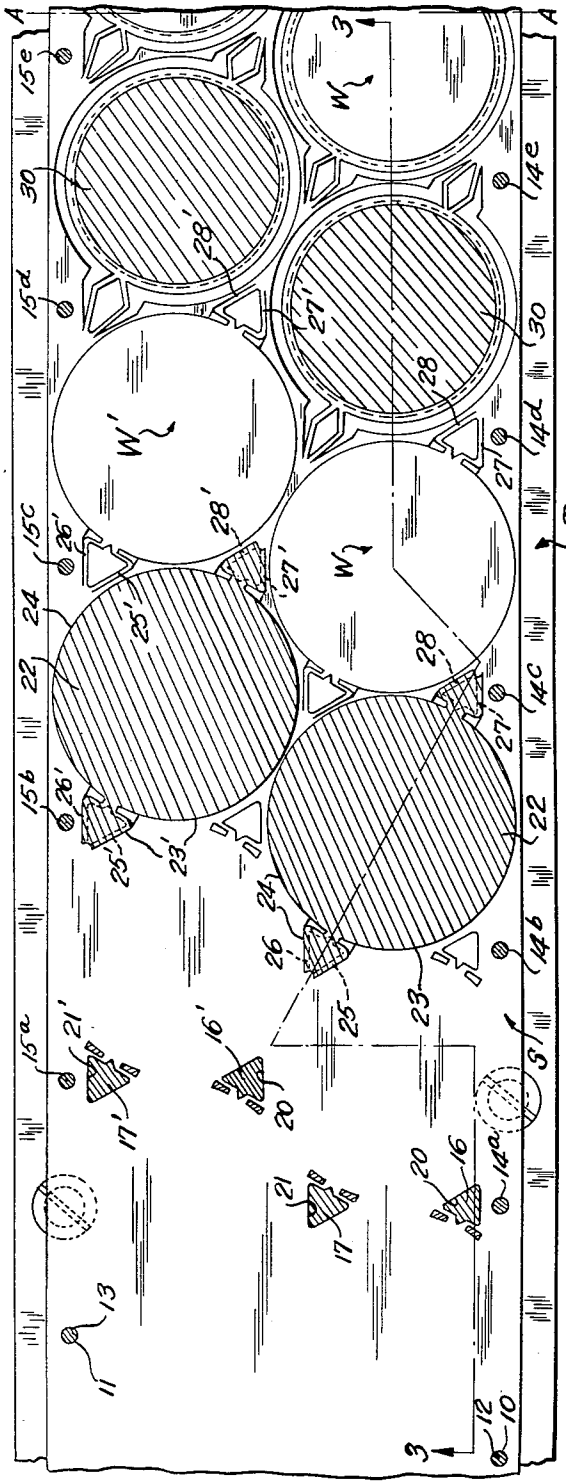


FIG. 1

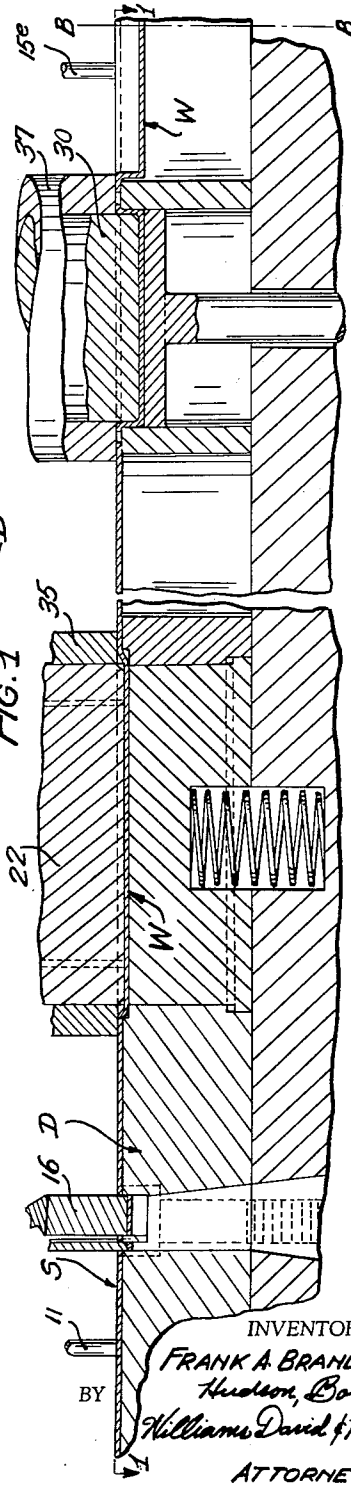


FIG. 3

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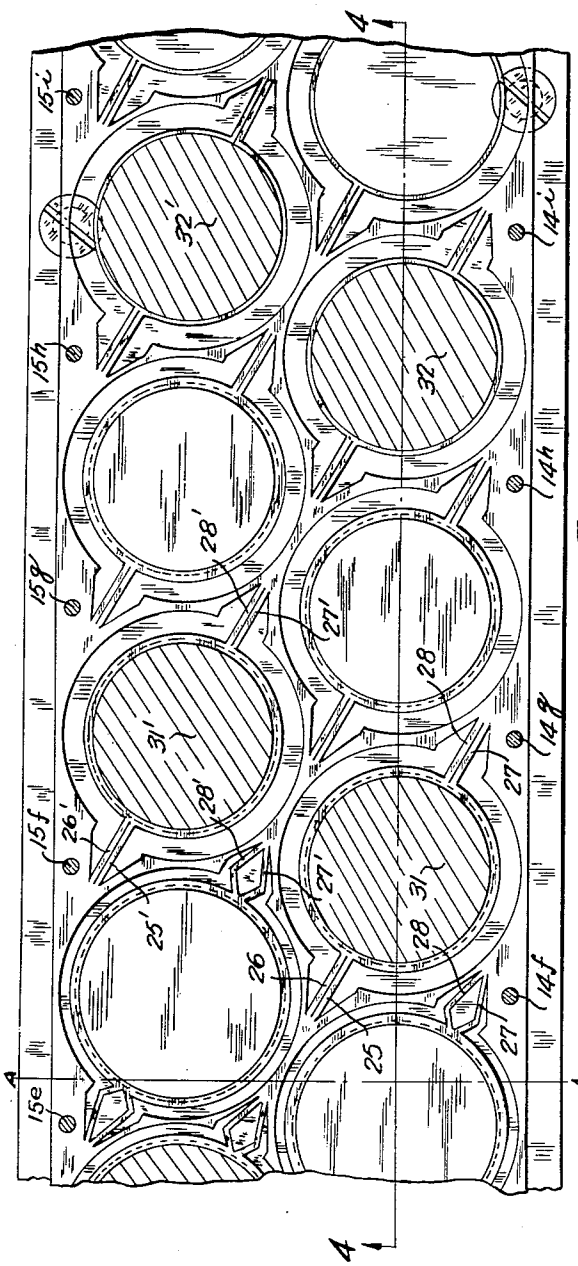


FIG. 2

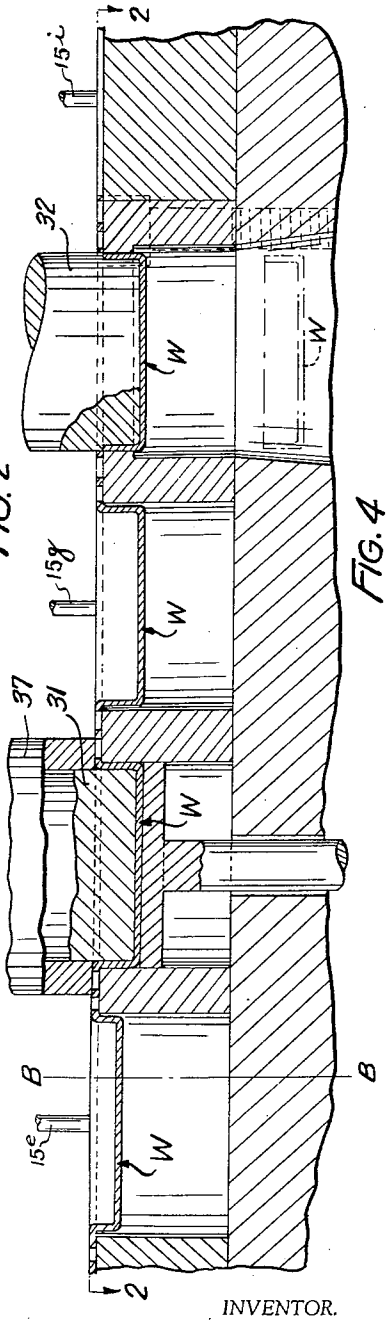


FIG. 4

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United States Patent Office

3,034,466

Patented May 15, 1962

3,034,466

METHOD AND BLANK FOR PROGRESSIVE DIE SHAPING OF SHEET-LIKE STOCK

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Filed Dec. 19, 1957, Ser. No. 703,827

5 Claims. (Cl. 113—116)

The present invention relates to metal working and more particularly to that type of metal working performed by progressive dies.

The principal object of the invention is the provision of a new and novel method of and blank for use in forming articles by progressive dies whereby more articles can be produced from a given amount of material.

Another object of the invention is the provision of a new and novel method of metal working wherein sheet-like stock is cut to form a row of generally circular blanks connected to the stock by a plurality of irregularly-shaped narrow sections of stock spaced about the periphery of the blank with their respective ends connected to the stock and blank at points approximately 15° to 45° from a line connecting the centers of adjacent blanks performing one or a plurality of dieing operations upon the blank while connected to the stock, and carrying the blank from one operation to the next by moving the stock.

Another object of the invention is the provision of new and novel metal stock for use in progressive die shaping comprising a sheet of stock having a row of blanks connected thereto by a plurality of irregularly-shaped narrow sections of stock spaced about the periphery of the blanks and having their one ends connected to the stock at points approximately 30° from a line connecting the centers of adjacent blanks and their other ends connected to the blanks at points not greater than approximately 15° offset from the first.

Further objects and advantages of the invention will be apparent to those skilled in the art to which it relates from the following description of the preferred embodiment described with reference to the accompanying drawings forming a part of this specification, in which similar reference characters designate corresponding parts, and in which:

FIGS. 1 and 2 together form, when joined at the lines A—A, a fragmentary sectional view of a progressive die set and sheet of stock approximately on the lines 1—1 and 2—2 of FIGS. 3 and 4 and,

FIGS. 3 and 4 together form, when joined at the lines B—B, a fragmentary sectional view approximately on the lines 3—3 and 4—4 of FIGS. 1 and 2.

Referring to the drawings, the referencee character S designates generally a sheet of stock preferably in strip form and which is adapted to be moved from left to right so as to progressively step predetermined areas of the stock from one operating station to another. In the embodiment shown two duplicate operations are performed side by side at each station with the result that two articles are formed upon each closing of the press or die set. It is, however, to be understood that one or any desired number of duplicate operations may be performed at each station. The duplicate side-by-side stations are offset with respect to each other in the direction of stock movement an amount equal to one-half the length of the stations and the stations nested together so as to save stock. In the following description merely those parts and operations employed and performed to make one blank will be referred to in detail. The parts employed in making the second blank will be designated with like reference characters with a prime mark affixed thereto.

At the first station, the stock is cut by pairs of punches 10, 11 to form pairs of pilot holes 12, 13 which holes

receive pairs of pilot pins 14^a, 15^a, to 14^l, 15^l located at the succeeding stations. At the second station the stock is cut or punched by a pair of punches 16, 17 to provide two triangularly-shaped apertures 20, 21 therein. At the next station the stock is cut or lanced by a punch 22 along the lines 23, 24 to provide a blank W connected to the stock by a plurality of pairs, in the present instance two, of irregularly-shaped sections or strips of stock, 25, 26 and 27, 28 each pair being equally spaced about the periphery of the blank with their respective ends connected to the stock and blank at points generally opposite to one another. At subsequent stations, one or a plurality of die operations are performed on the blank as the stock is moved in steps to progressively carry the blank from station to station. In the present instance, to facilitate illustration of the invention, alternate stations subsequent to the lancing station are idle stations. In practice the heat generated in the stock at the working stations assist or facilitates the working of the stock at the subsequent working stations. The working stations therefore are preferably made to follow one after the other so as to minimize the cooling of the stock between operations.

The narrow or strip-like sections of stock which, so to speak, tie the blanks to the stock, are irregular in shape and the two sections of each pair form a narrow sided hollow regular trapezoid or triangle having its apex projecting from the periphery of the blank and connected to the stock. The base is connected to the blank by a short section of uncut stock directly below the apex. Each pair of tie sections of stock is located approximately 30° from a line connecting adjacent blanks in any given row of blanks, and parallel with direction of travel of the stock through the die set or press which in the embodiment shown is from left to right as viewed in the drawings. The construction described locates the tie sections of stock from the blanks between adjacent blanks but not between the portions thereof which are closest together, with the result that the blanks can be located closer together than is possible with any other arrangement.

From the lancing station or position, the blank formed therein is carried to the next succeeding station which in the embodiment shown is an idle station, by advancing the stock an amount equal to the distance between the centers of adjoining blanks while the die set or press is open. The next station is a drawing station and upon the following closing of the die set or press operation, a drawing operation is performed upon the blank by a punch 30. This operation reduces the over-all diameter of the blank and has a tendency to straighten out the two side strips of each of the trapezoidally shaped narrow sections of stock connecting the blank to the stock. In a succeeding working station or stations suitable punches such as the punch 31 perform subsequent dieing operations upon the blank if such are desired. These operations successively reduce the over-all diameter of the blank and straighten out or tend to straighten out the narrow sections or tie strips of stock until the desired article is produced. In the last working station the blank may be trimmed as by the trimming punch 32.

The amount that the blank can be reduced in diameter without rupturing the tie sections of stock which connect it to the stock proper for any given height of trapezoidal shape depends upon the length of the base of the section, and both the height and the length of the section is a function of the distance between adjacent rows of blanks and adjacent blanks in any one row. The preferred construction shown, however, gives maximum reduction for stock of any given width.

The die set shown comprises a die D having two rows of cavities adapted to cooperate with blanking, drawing and trimming punches employed to perform a desired working or dieing operation. The die cavities, as previ-

ously implied, are arranged side by side in the die with the transverse center lines of the cavities of one row positioned intermediate those of the adjacent row so as to provide a greater number of cavities for a die of any given size than would otherwise be the case and in turn to reduce the scrap stock to a minimum. The reference characters **35**, **36**, **37** designate hold-downs for the punches **22**, **30**, **31**, respectively.

Machines suitable for carrying out the method of the present invention and for carrying the die and punches herein referred to are shown in United States patents to Frank A. Brandes No. 2,539,807 and 2,766,710 issued January 30, 1951, and October 16, 1956, respectively, and in the present instance, only those parts of the stock, the die and the punches which are necessary for an understanding of the present invention are herein shown and described. It is to be understood that the die and punches referred to are constructed in and operated in a manner generally similar to those referred to in the aforesaid patent and well known in the art.

It will be apparent from the foregoing that the trapezoidally shaped sections of stock referred to each comprise two irregularly-shaped narrow strips and it is to be understood that the bases and apexes may be reversed, that one or the other of the strips which make up the trapezoidal sections may be omitted if desired and/or that the strip or strips may be of any suitable nonlinear shape so long as no part of the strip or strips extend between the blanks where they are closest to one another.

Having thus described my invention, what I claim is:

1. The method of forming an object by progressive die operations performed at a plurality of stations which comprises performing a die operation upon sheet-like metal stock to form a row of blanks having a plurality of narrow irregularly shaped sections of stock spaced about the periphery thereof with the ends thereof connected to the stock connected thereto at points approximately 30° from the longitudinal centerline through adjacent blanks and the other ends connected to the blanks at points not greater than approximately 15° from the first, performing a die operation upon the blanks while connected to the stock, and carrying the blanks to said die operation by moving the stock.

2. The method of forming an object by progressive die operations performed at a plurality of stations which comprises performing a die operation upon sheet metal-like stock to form a row of generally disc shaped blanks having a plurality of narrow irregularly shaped sections of stock spaced about the periphery thereof with the ends

thereof connected to the stock connected thereto at points approximately 30° from the longitudinal centerline through adjacent blanks and the other ends connected to the blanks at points not greater than approximately 15° from the first and having voids between portions of the sections and the blanks, performing a die operation upon the blanks while connected to the stock, and carrying the blanks to said die operation by moving the stock.

3. A sheet-like metal strip of a progressive die operation comprising a row of blanks, a plurality of narrow irregularly shaped sections of stock spaced about the periphery of said blanks having their one ends connected to the stock at points approximately 30° from the longitudinal centerline through adjacent blanks and their other ends connected to the blanks at points not greater than approximately 15° from the first.

4. A progressive die operation for making a sheet metal strip comprising, forming a succession of aligned circular blanks in the stock, each blank surrounded by stock, forming a plurality of irregularly shaped narrow sections of metal having one end connected to the stock at a point from 15° to 45° from a center line connecting the centers of adjacent blanks and the other end connected to the blank at a point from 15° to 45° from a center line connecting the centers of adjacent blanks.

5. A sheet metal strip of a progressive die operation comprising a succession of aligned circular blanks, stock surrounding each blank, a plurality of irregularly shaped narrow sections of metal having one end connected to the stock at a point from 15° to 45° from a center line connecting the centers of adjacent blanks and the other end connected to the blank at a point from 15° to 45° from a center line connecting the centers of adjacent blanks.

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