Aug. 11, 1953 J. H. FRIEDMAN 2,648,077

TRANSFER MECHANISM

Filed Aug. 3, 1946 3 Sheets-Sheet 1

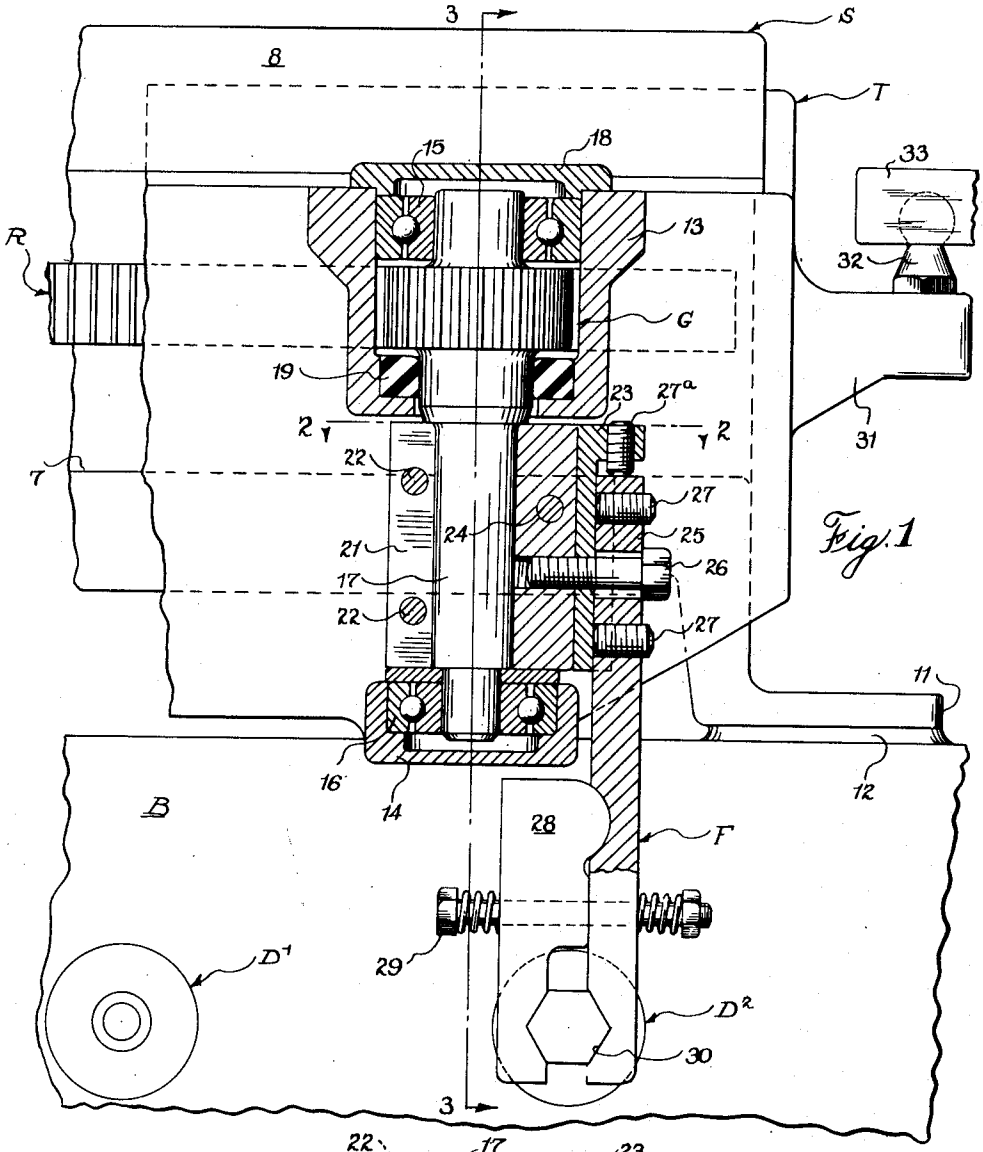


Fig. 1

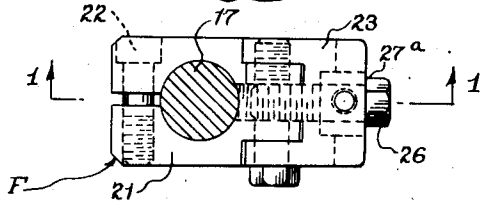


Fig. 2

INVENTOR.
JOHN H. FRIEDMAN
BY Richey & Watts
ATTORNEYS

Aug. 11, 1953 J. H. FRIEDMAN 2,648,077

TRANSFER MECHANISM

Filed Aug. 3, 1946 3 Sheets-Sheet 2

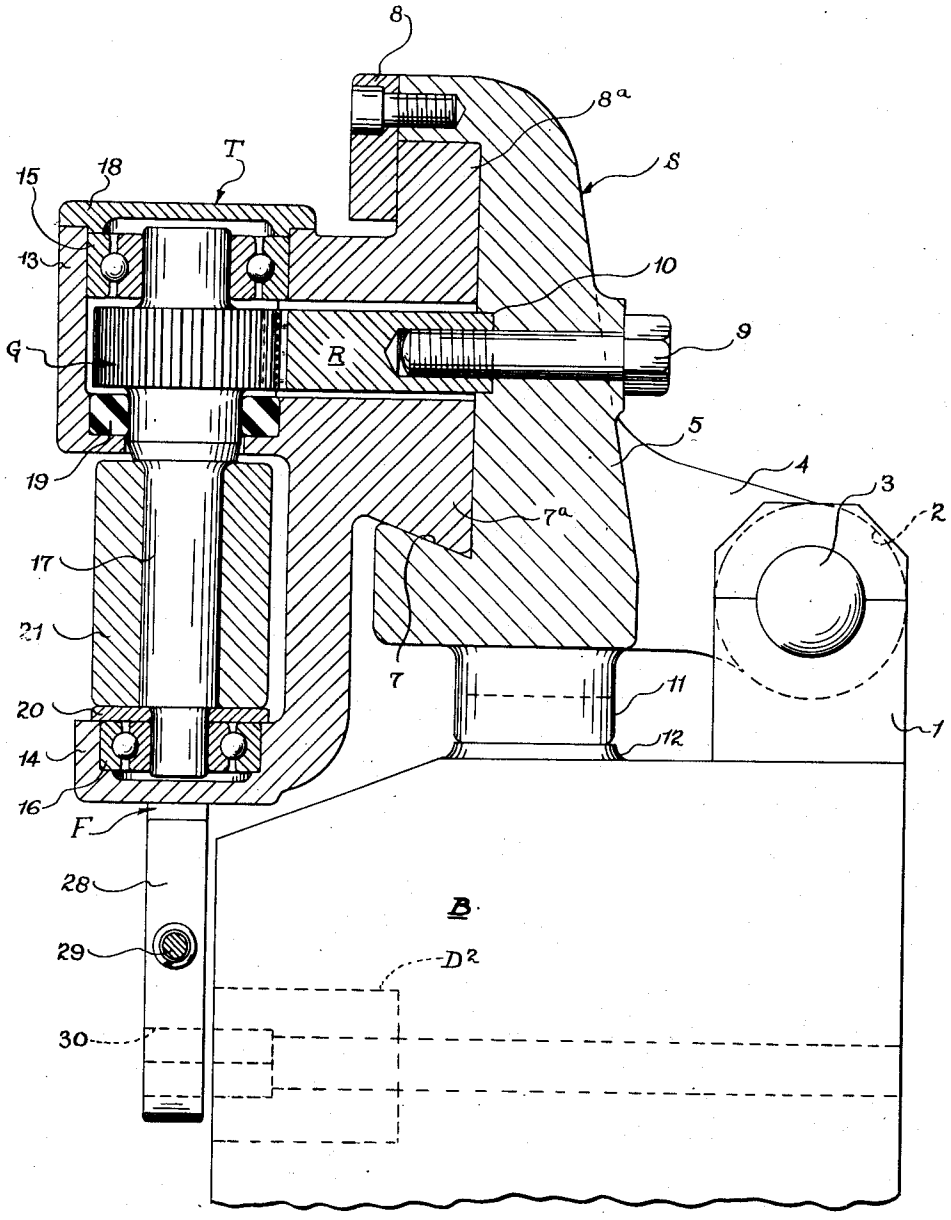


Fig. 3

INVENTOR.
JOHN H. FRIEDMAN

BY Richey & Watts

ATTORNEYS

Aug. 11, 1953 J. H. FRIEDMAN 2,648,077

TRANSFER MECHANISM

Filed Aug. 3, 1946 3 Sheets-Sheet 3

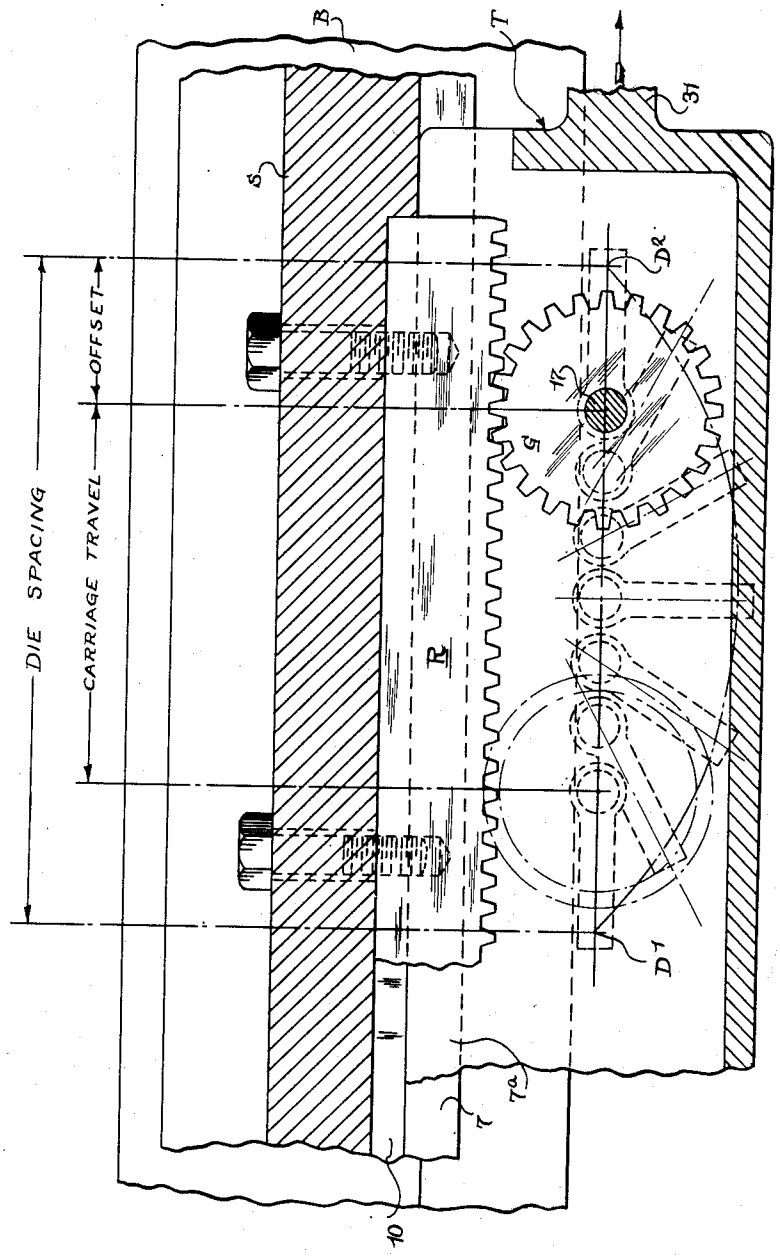


Fig. 4

INVENTOR.
JOHN H. FRIEDMAN
BY Ricky + Watts
ATTORNEYS

Patented Aug. 11, 1953

2,648,077

UNITED STATES PATENT OFFICE

2,648,077

TRANSFER MECHANISM

John H. Friedman, Tiffin, Ohio, assignor to The National Machinery Company, Tiffin, Ohio, a corporation of Ohio

Application August 3, 1946, Serial No. 688,383

2 Claims. (Cl. 10—12)

1

This invention relates to cold headers, and is specifically directed to improvements in the transfer mechanism associated with certain types of such machines.

In a header of the type to which this invention relates, two or more dies are provided in which operations are performed upon the blank by various tools mounted upon a reciprocating header slide, the general arrangement being such that the blank is turned over before it is presented to succeeding dies. One method which has been utilized for turning the blank over and transferring it to a succeeding die has been to mount the blank on a finger assembly mounted upon a gear driven arm, the center of the driving gear being disposed mid-way between the die centers. A rack has been provided to rotate the gear and flip the arm blank from one die to the other. With such an arrangement the length of the arm must be equal to half the distance between the die centers which means that the header slide must have retracted at least half the die spacing by the time that the transfer stroke is half completed, in order that the header slide may clear the transfer finger assembly. Since the header slides are conventionally driven by a crank mechanism, for a given header stroke the speed at which the slide retracts cannot be controlled so it has been necessary to delay somewhat the actuation of the transfer finger mechanism in order that the slide can be well clear when the arm is mid-way in its stroke. This has meant that the transfer mechanism must operate rather rapidly in order to complete its operation in the time alloted, and rapid operation in high speed machines results in shock and wear on the parts. Accordingly, it is an object of this invention to reduce the delay in initiating the transfer stroke by providing a relatively shortened finger supporting arm for a given die center, the shortened arm permitting the transfer action to occur earlier in the retract cycle of the header slide.

Briefly, this object is accomplished by providing a fixed rack and a movable transfer carriage and by having the transfer carriage carry the necessary number of gears to operate the finger supporting arms. By proper arrangement of these parts the transfer fingers can be made to describe a segment of a cycloid, the cord of which is equal to the die spacing. Since the cycloid is inherently a flatter curve than that of a semicircle, the arm never projects past the die face as far as it would in conventional structure and transfer action may be initiated earlier in the slide retract stroke.

2

Another object of this invention is to provide transfer mechanism wherein the gears are moved against a stationary rack but wherein, although the transfer fingers make the necessary one-half turn during the transfer stroke, the actual travel of the transfer slide that carries the gears is less than the die spacing. This is accomplished by designing the mechanism so that the fingers follow the path of a cycloid and the center of the gear at its extreme positions lies along the cord and falls within one arc portion of the curve. These and other objects will be apparent as the following detailed description of the invention proceeds.

In the drawings:

Fig. 1 is a front view of one of the transfer finger assemblies, transfer slide and its support, and a portion of the die block;

Fig. 2 is a transverse section through the finger supporting arm taken on 2—2 of Fig. 1;

Fig. 3 is a transverse section taken on 3—3 of Fig. 1; and

Fig. 4 is a schematic plan view partially sectioned showing the principle of operation of the device and the path traced by the transfer finger as it is moved from one die to the other.

In the drawings, the die block is shown generally at B, it being understood that any even number of dies and transfer fingers may be used with this arrangement, only one pair of dies being disclosed. The transfer slide support S is mounted pivotally on a bracket 1 which may be part of the die block or of the machine frame. Bearing cap 2 is fastened to block 1 in any convenient manner and receives a pivot 3 of any convenient design which by means of bracket 4 pivotally supports the body of the slide S upon the machine frame. As is known in this art, it is desirable to provide such a pivotal construction in order that the entire transfer assembly may be raised clear of the die block for maintenance.

The slide body may be formed with a V-shaped groove 7 to slidingly support the transfer carriage unit T. The upper portion of the header slide may have a movable plate 8, which, in cooperation with the L-shaped upper portion of the slide, forms an upper bearing and retaining portion for the transfer unit T. Transfer unit T is formed with cooperating structures 7a and 8a to slide in the aforementioned portions of slide member S. Slide member S may also be provided with a series of bolts 9 to retain a stationary rack R thereon and I prefer to notch the slide as at 10 to locate the rack positively. Each end of the pivoted slide S may be provided with a foot 11 which may be clamped or bolted against pads

12 on the die block or machine frame in any convenient manner. The transfer carriage unit T has upper and lower support portions 13 and 14 which, by means of bearings 15 and 16, mount a shaft member 17 which carries the operating gear G. Of course, it is customary to provide one of these assemblies for each pair of dies in the machine. The upper housing 13 may be closed by a cap member 18 and a sealing washer 19 is provided to retain the lubricant and likewise a sealing washer 20 may be fitted adjacent the lower bearing 16.

Clamped to the gear driven shaft 17 is the block 21 which is split and attached by means of clamp bolts 22. Block 21 is in effect a transfer finger supporting arm and the length of the block determines the offset between the centerline of transfer fingers F and the axis of rotation of shaft 17. A pivoted adjusting block 23 is fastened by transverse bolt 24 and a finger supporting bar 25 is mounted in a notch in the tilting block 23 and retained therein by the retaining bolt 26. A pair of set screws 27 may be provided for lateral adjustment of the finger block, and vertical adjustment may be had by manipulating screw 27*a*. This general type of assembly is described in detail in my co-pending application, Serial No. 663,569, filed April 19, 1946, now Patent No. 2,542,864 issued February 20, 1951. The other finger arm 28 is spring urged to grip the blank by means of a bolt and spring assembly 29, and blank gripping notches are formed in the two fingers.

The ball support bracket 31 is attached to the transfer carriage unit T and the ball member 32 thereon is actuated by a link 33 timed to move the transfer mechanism during the proper part of the cycle as is customary in these machines and as has been described in my said co-pending application, Serial No. 663,569.

The principle of operation of this structure is illustrated in the diagram found in Fig. 4 wherein a simplified and partially sectioned plan elevation of the assembly appears. In the interest of clarity transfer fingers F and their mounting block 21 are shown as a simple arm, denoted by F. In this view it is seen that as the transfer unit T is pulled from the position at the left where finger F is positioned in front of die D_1, to the position at the right where the finger is presented to die D_2, that the gear G is moved along the stationary rack R. Thus, rack R acts as a reaction member and gear G as an action member causing rotation of shaft 17 in response to reciprocation of the carriage. It can be seen that the travel of the finger support carriage T is less than the spacing between adjacent dies. However, it can also be seen that part of the motion of the transfer fingers as they move from one die to the other is due to linear translation of the carriage T, whereas another part is due to rotation of the finger about its shaft 17, and these motions are additive. As a result, the offset between the axis of shaft 17 and the centerline of the pockets 30 in the transfer fingers can be considerably shorter than half the distance between adjacent dies. Thus, even when the transfer fingers extend outwardly from the die block a maximum distance, as when the stroke is half completed, this extension is appreciably shorter than it would be in an arrangement wherein the rack is moved across the gears. With a moving rack, the offset between the shaft axis and transfer finger centerline must be equal to one-half of the die spacing. In other words, in this arrangement advantage is taken not only of the offset of the transfer fingers, but advantage is also taken of the linear translation resulting from motion of the carriage. As a result of this construction, for a given die spacing and a given transfer finger offset, carriage travel is less than the die spacing by an amount equal to twice the offset of the transfer fingers from their axis of rotation.

Although I have illustrated a specific form of die support finger mechanism, it is understood that this invention is not limited to the use of any such form, the essence of the invention being to provide a mechanism to cause a finger to trace that portion of a cycloid or similar curve illustrated in Fig. 4.

I have illustrated a specific finger housing and supporting mechanism in the interests of completeness but it will be understood that such mechanism may be varied at will, the essence of the invention not lying in the finger support mechanism but in the arrangement of the transfer carriage, its support and the method of driving the finger from one die to the other. I contemplate that various modifications in design details over those shown in this description may be made without departing from the spirit of the invention as defined in the appended claims.

Having thus described the present invention so that others skilled in the art may be able to understand and practice the same, I state that what I desire to secure by Letters Patent is defined in what is claimed.

What I claim is:

1. In a machine for forming metal articles, a bed frame, a vertically disposed die breast in said bed frame, a plurality of spaced die stations arranged in said die breast with the axes of said stations being in the same horizontal plane and adapted to receive blanks to be worked by a header slide reciprocating horizontally in said bed frame, transfer mechanism to transfer the blanks to be worked horizontally from one die station to the next adjacent die station comprising a horizontally disposed guideway on the bed frame above the die breast and spaced horizontally with respect to the vertical plane of the die breast, a horizontally disposed rack fixed with respect to the bed frame and having the rack teeth thereof extending toward the header slide, said rack teeth terminating in a vertical plane spaced from the vertical plane of the die breast, a reciprocating carriage mounted in said guideway, a vertically disposed transfer finger support pivotally mounted in said carriage in a vertical plane more nearly adjacent the header slide than said rack, a gear in said support in mesh with said rack, the vertical axis of said support being maintained between two adjacent die stations during the reciprocation of said carriage, means to reciprocate said carriage through a horizontal distance less than the distance between two adjacent die stations, a pair of depending transfer fingers carried by said support, said fingers being offset with respect to the vertical axis of said support to extend horizontally therefrom to position said fingers in alignment with the die station most nearly adjacent said support at each end of its reciprocation, whereby said offset supplements the horizontal travel of the carriage in transferring a blank from one die station to the next.

2. In a machine for forming metal articles, a bed frame, a die breast in said bed frame disposed transversely of the frame, a plurality of spaced die stations arranged in said die breast with the axes of said die stations being in the same plane

normal to the die breast and adapted to receive blanks to be worked by a header slide reciprocating normal to the die breast, transfer mechanism to transfer the blanks horizontally which are to be worked from one die station to the next adjacent die station comprising a horizontally disposed guideway transverse of the bed frame and being spaced with respect to both the plane of the die breast and said plane normal to the die breast, a horizontally disposed rack fixed with respect to the bed frame and having the rack teeth thereof extending toward the header slide, said rack teeth terminating in a plane parallel to and spaced from the plane of the die breast, a transfer carriage mounted in said guideway for movement between die stations, a transfer finger support pivotally mounted in said carriage in a plane parallel to the die breast and more nearly adjacent the header slide than said rack, a gear on said support in mesh with said rack, the pivotal axis of said support being maintained between two adjacent die stations during the movement of said carriage, means to move said carriage through a horizontal distance

less than the distance between two adjacent die stations, a pair of transfer fingers carried by said support, said fingers being offset with respect to the pivotal axis of said support to extend laterally therefrom and to thereby position said fingers in alignment with the die station most nearly adjacent said support at each end of the path of carriage travel whereby said offset supplements the horizontal travel of the carriage in transferring a blank from one die station to the next.

JOHN H. FRIEDMAN.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
Re. 17,990	Davis	Mar. 10, 1931
1,982,460	Wilcox	Nov. 27, 1934
2,100,028	Frayer	Nov. 23, 1937
2,128,186	Jones	Aug. 23, 1938
2,360,906	Smith	Oct. 24, 1944
2,544,218	Burdsall	Mar. 6, 1951