May 13, 1952 H. NELSON 2,596,911

SHEET METAL PUNCHING APPARATUS

Filed Sept. 14, 1948 5 Sheets-Sheet 1

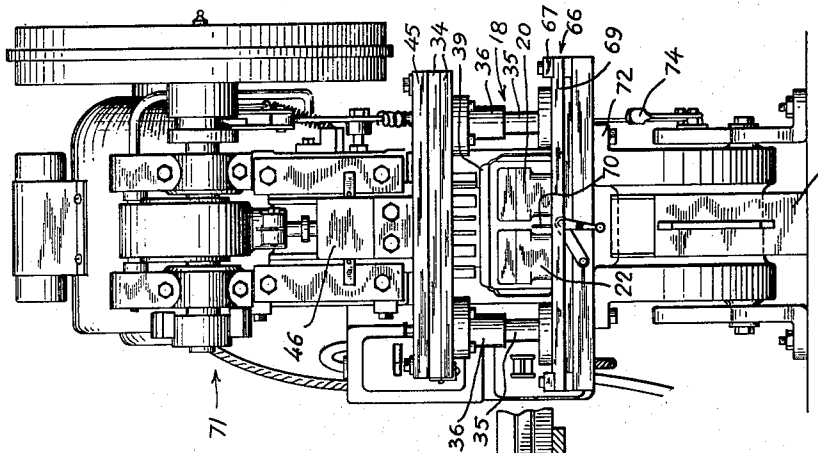



FIG. 2

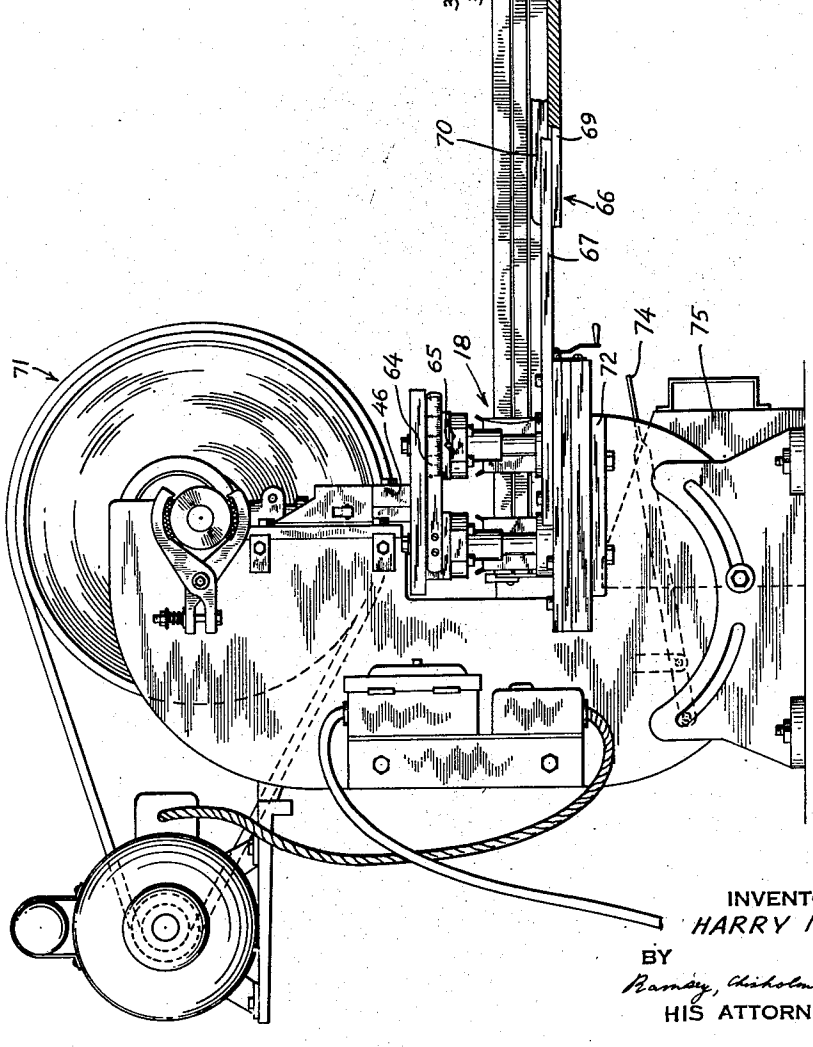



FIG. 1

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SHEET METAL PUNCHING APPARATUS

Filed Sept. 14, 1948 5 Sheets-Sheet 2

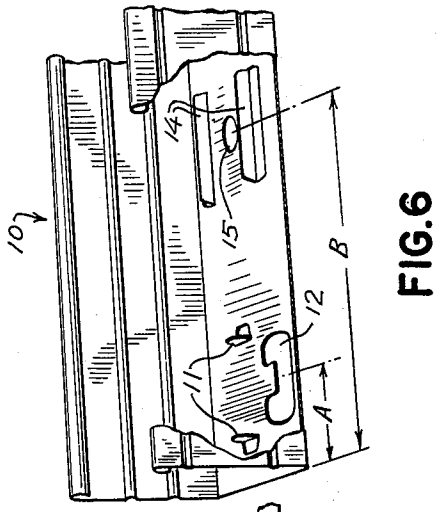



FIG.6

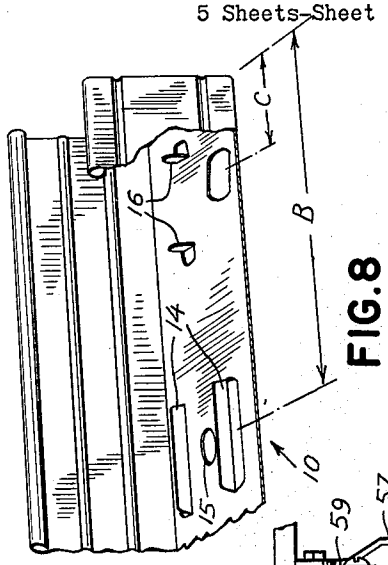



FIG.8

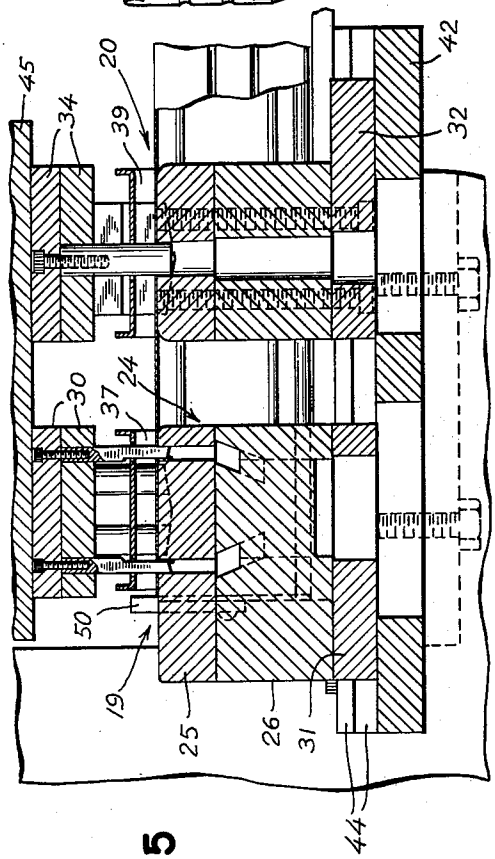



FIG.5

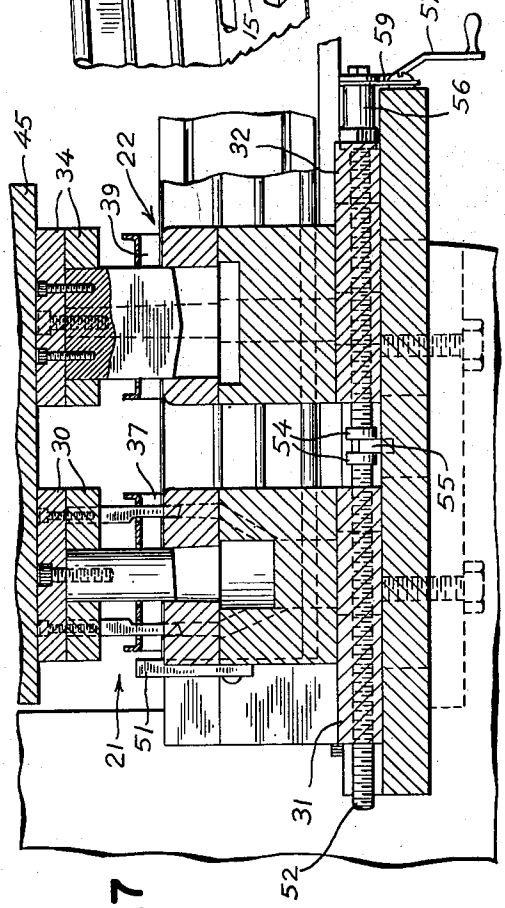



FIG.7

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SHEET METAL PUNCHING APPARATUS

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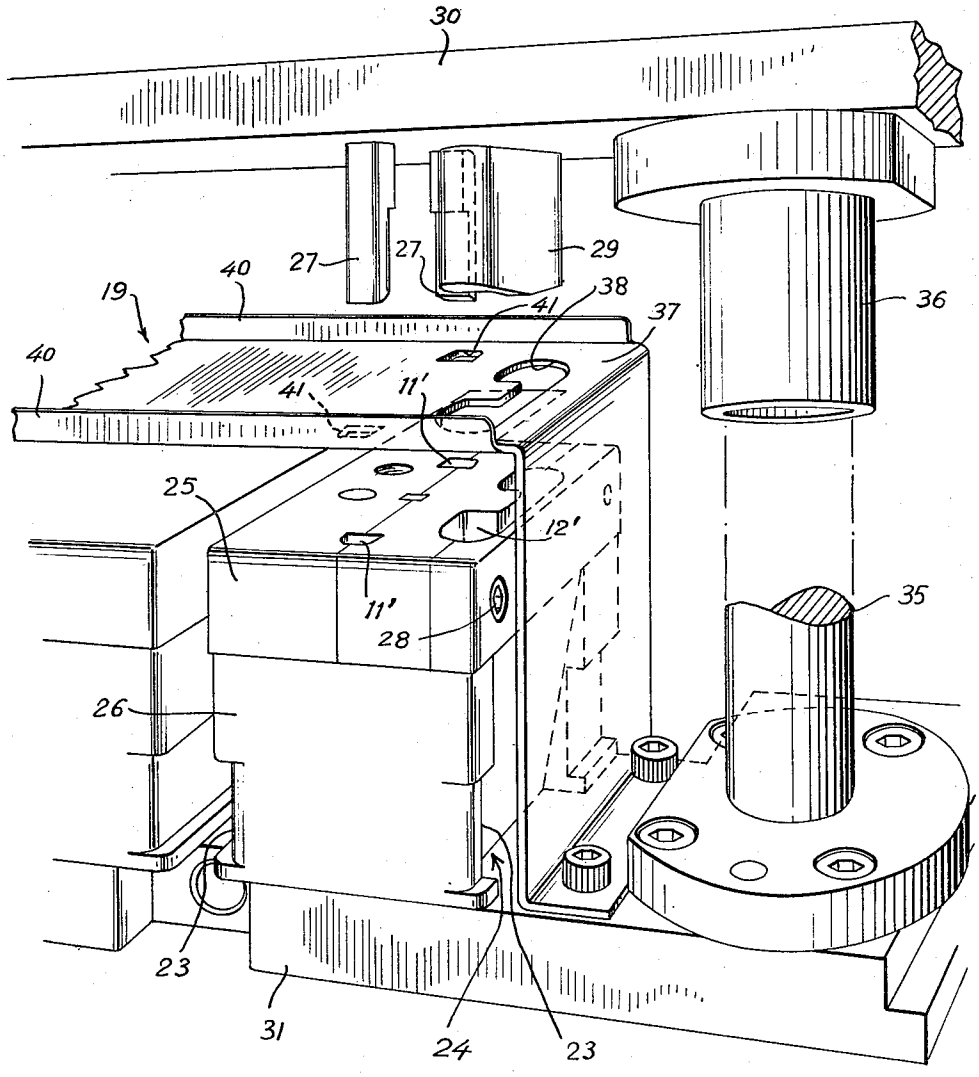



FIG. 9

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SHEET METAL PUNCHING APPARATUS

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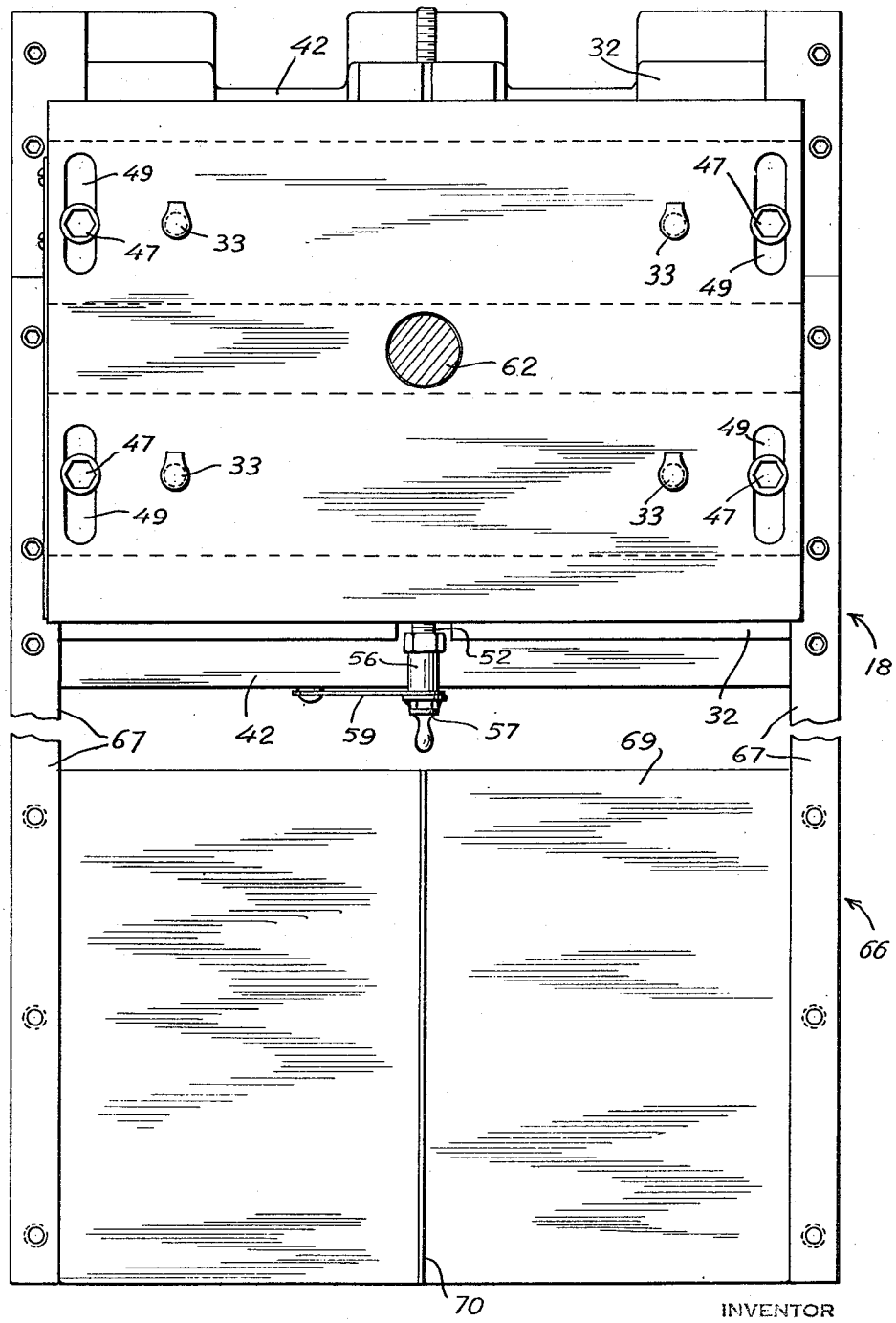



FIG. 10

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SHEET METAL PUNCHING APPARATUS

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FIG. 3

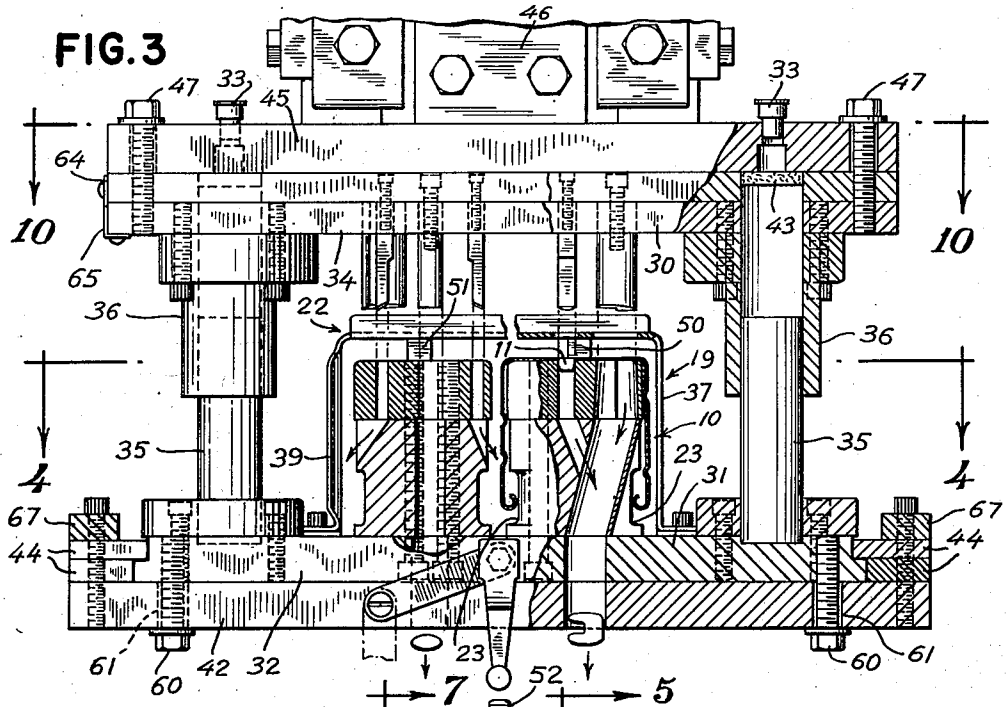
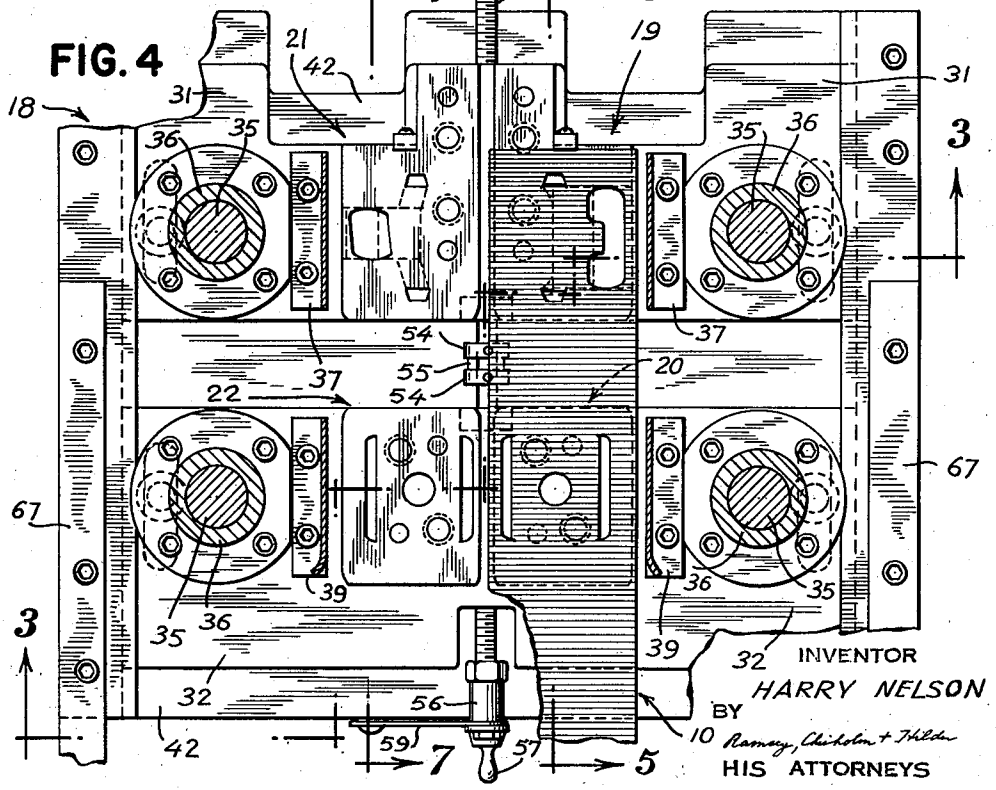



FIG. 4




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# UNITED STATES PATENT OFFICE

2,596,911

## SHEET METAL PUNCHING APPARATUS

Harry Nelson, New York, N. Y., assignor to Lorentzen Hardware Mf'g. Corp., New York, N. Y., a corporation of New York

Application September 14, 1948, Serial No. 49,271

8 Claims. (Cl. 164—85)

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This invention relates to Venetian blinds and more particularly to a machine for the production of head bars for blinds.

Venetian blinds of the so-called "enclosed metal head" type are provided with a sheet metal head bar which is usually channel-shaped in cross section, the mechanism for raising and tilting the blind being contained within such channel. With such a head bar arrangement, the bottom wall of the bar is perforated to provide for passage of the ladder tape branches, lift cords and tilt cord.

The blind raising and tilting mechanism within the head bar usually comprises several fittings, e. g. a tilter mechanism, a cord lock and two or more tilt rod cradles, all of which are usually mounted on the inside surface of the bottom wall of the head bar. These fittings are sometimes located and held in position by metal tabs which may be struck from the bottom wall of the head bar in forming passages for the blind cords or ladder tapes, the tabs being bent over mounting flanges of the fittings to retain them in position. Such a head bar is shown in my copending application S. N. 778,002. The form of machine herein disclosed is adapted for both the punching of properly-located holes for the passage of the blind cords and the ladder tape branches and for the striking of tabs for securing the various fittings in the head bar channel. Prior to such punching, the head bar channel may be severed to the desired length from head bar channel stock of indeterminate length.

In the form shown, the invention comprises a mechanically-driven press in which the ram is controlled by a lever, depression of which trips the press to produce a single stroke and return of the ram to raised position. A complete set of four dies for punching all openings required in the head bar is mounted in the press, the dies being arranged side by side in pairs with one pair placed behind the other pair, one die of each pair being used for the proper punching of a single end of the head bar. All four dies are simultaneously operated by each stroke of the press. A head bar support extending in front of the press aids in positioning and supporting the head bar during the punching operation. A feature of the present invention is that the distance between the pairs of dies may be adjusted simultaneously to vary the rout distance (distance from each end of the head bar to the adjacent lift cord and ladder tape) to provide for the manufacture of head bars for blinds of varying widths.

An object of the present invention is to provide a machine having adjustable dies for the punching of metal Venetian blind head bars.

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Another object of the invention is to provide a machine having separate dies for the punching of each end of a metal Venetian blind head bar, the dies being simultaneously adjustable to vary the rout distance of the head bar.

Another object is to provide an improved work supporting guide in conjunction with dies for the successive punching of each end of a metal Venetian blind head bar.

A further object is to provide generally improved dies for striking tabs and forming openings in metal Venetian blind head bars.

Further objects, and objects relating to details and economies of construction and operation will more definitely appear from the detailed description to follow.

My invention is clearly defined in the appended claims. In the claims, as well as in the description, parts are at times identified by specific names for clarity and convenience, but such nomenclature is to be understood as having the broadest meaning consistent with the context and with the concept of my invention as distinguished from the pertinent prior art. The best form in which I have contemplated applying my invention is illustrated in the accompanying drawings forming part of this specification, in which:

Fig. 1 is a left side elevation of a press, including dies according to the present invention. A portion of the channel support has been broken away and a channel-shaped metal head bar is shown in position within the dies for the punching operation.

Fig. 2 is a front elevation of the press shown in Fig. 1.

Fig. 3 is a front elevation of the dies, portions of the die blocks and associated parts being shown in vertical section taken on the line 3—3 of Fig. 4.

Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 3, two corner sections of the die shoe and the channel support being broken away.

Fig. 5 is a vertical section taken on the line 5—5 of Fig. 4.

Fig. 6 is a somewhat diagrammatic fragmentary isometric view of the tilter end of a channel-shaped Venetian blind head bar, the bottom wall of which has been punched with the dies shown in Fig. 5.

Fig. 7 is a vertical section of the dies taken on the line 7—7 of Fig. 4.

Fig. 8 is a somewhat diagrammatic view of the cord lock end of a channel-shaped Venetian blind head bar, the bottom wall of which has been punched with the dies shown in Fig. 7.

Fig. 9 is an enlarged fragmentary perspective view showing one of the dies.

Fig. 10 is a top plan view of the die set and channel support, portions of the support being broken away for convenience of illustration.

The operation of the machine shown and an appreciation of its advantages will be facilitated by an understanding of the general construction of the so-called "enclosed metal heads" now used in many Venetian blinds.

Where an enclosed metal head is used, the operating mechanism of the blind is entirely contained within a sheet metal head bar which is often of channel form. The operating mechanism of the blind includes various fittings such as a cord lock, a tilter and cradles for supporting a tilt rod running longitudinally of the head bar. These fittings are sometimes anchored to the bottom wall of the channel by tabs which are struck up from the bottom wall thereof.

In the above-mentioned Venetian blind construction, holes must be provided in the bottom wall of the head bar for passage of the longitudinally-extending branches of the ladder tape which supports the blind slats, and for the passage of the tilt cord and lift cords. It has been found to be advantageous in some instances to form tabs for retaining a fitting in position from the metal struck from the bottom wall of the head bar in forming the holes needed for the passage of the ladder tapes. Such a construction is disclosed in Figs. 6 and 8 in which the two end portions of a head bar **10** are shown. The head bar **10** is intended for use in a Venetian blind having a ladder tape adjacent each side of the blind, having a tilter at the left side of the blind and having a lift cord pendant at the right side of the blind. This construction, including the fittings, is shown in more detail in my copending application S. N. 778,002.

For the foregoing head bar construction, a pair of tabs **11**, **11** and a U-shaped hole **12** formed at the left end of the head bar **10** may be provided to accommodate a tilter fitting and tilt cord. This organization of tabs and hole is centered a constant distance from the left end of the head bar **10**, this distance being indicated by A in Fig. 6. In addition, the left end portion of the head bar **10** is provided with a pair of tabs **14**, **14** and a round hole **15** for receiving a tilt rod cradle and a lift cord. These tabs and hole are not a fixed distance from the left end of the head bar, the distance B of Fig. 6 being varied according to the overall width of the blind. This distance B is known in the trade as the "rout distance."

Referring to Fig. 8, a pair of tabs **16**, **16** and a hole **17** are provided for the cord lock fitting located at the right end of the head bar. This organization of tabs **16**, **16** and hole **17** is centered at a constant distance C from the right end of the head bar, this distance not being varied regardless of the width of the blind. In addition, a group comprising tabs **14**, **14** and hole **15** is provided for a second tilt rod cradle fitting positioned in the right end portion of the head bar **10**. This group is located a varying rout distance B from the right end of the head bar, according to the width of the blind, and is equal to the rout distance B at the opposite end of the head bar. The die set to be described is adapted to facilitate the rapid and accurate punching of the bottom wall of the head bar channel **10** to form these tabs and holes.

The die set, designated as a whole by **18**, comprises four separate dies which are designated as a whole by **19**, **20**, **21** and **22**, respectively. These dies are mounted as a single unit for simultaneous operation. Each die consists of a stationary die block and a cooperating set of punches which are telescoped into holes in the die block to form the desired holes and strike the desired tabs from the head bar **10**. Each group of holes and tabs formed in the bottom wall of the head bar **10** is cut by a separate die. While these dies are varied somewhat in shape for the cutting of the various shaped holes, they are of the same type and are all functionally similar; and only the die **19** will be described in detail.

The die **19** (Fig. 9) includes a die block **24** which may be of composite construction, the top or cutting member **25** of the block being formed of suitable alloy steel and the body **26** of the block being formed of ordinary steel for economy and convenience in manufacture. The cutting member **25** of the block, which may be made of a plurality of individual pieces held together by transverse cap screws such as **28**, is provided with holes shaped and located in correspondence with a group of holes and tabs desired in the bottom wall of the head bar **10**, the die of Fig. 9 being adapted for forming the tabs **11**, **11** and hole **12** shown in Fig. 6. The entire periphery of the hole **12'** provided in the cutting member **25** of the die block, for forming the hole **12** (Fig. 6), is sharpened or squared at the entrance to the hole so as to readily shear the bottom wall of the head bar. However, portions of the holes **11'**, **11'** of the cutting member **25**, for forming the tabs **11**, **11**, are rounded at the entrance to the holes to permit bending or striking the tabs from the bottom wall of the head bar without severing the tabs therefrom, the remainder of the peripheries of these holes being sharp to shear the outlines of the tabs. All of the holes in the die block **24** are continued downwardly therethrough (Fig. 3) and through the die block mounting plates in order to pass downwardly the slugs or small scraps of metal cut or torn from the head bar.

The die block **24** is proportioned to fit within the channel **10** and support the bottom wall of the channel against crushing during the punching operation. The die block may be recessed at **23**, **23** along both sides near its base to receive the rolled edges of the channel-shaped head bar **10**. Preferably the die block **24** is given a slight extra height so that the dies may be resharpened by grinding a small amount of metal from the top or cutting surface of member **25** so as to renew the cutting edge of holes **11'**, **11'** and **12'**.

Cooperating punches **27**, **27** and **29** are mounted in a punch plate **30** for reciprocative telescoping movement into the holes **11'**, **11'** and **12'** of the die block **24**. These punches have nearly squared lower ends fitting closely against the walls of the holes within the die block along all cutting portions of the holes. Proper clearance is allowed to permit striking of the tabs **11**, **11** without severing the base of the tabs and then to bend the tabs without cutting its base thereof.

The organization of punches and die block for the dies **20**, **21** and **22** is essentially the same,

the punches for each of these dies and the corresponding holes in the die block being arranged for the proper punching of the several groups of holes in the bottom wall of the head bar.

The dies are mounted side by side in pairs, one pair consisting of dies 20 and 22 and the other pair consisting of dies 19 and 21. The die blocks of dies 19 and 21 are mounted on a common base 31 and the die blocks of the dies 20 and 22 are mounted on a second common base 32 positioned in front of the base 31. The die blocks may be secured to the bases by bolts passing upwardly through bores in the base, through bores in the body portion of the die blocks, and threadedly engaged in the cutting members of the die blocks (Fig. 3).

The cooperating punches for the dies 19, 20, 21 and 22 are similarly arranged in pairs, the punches for the dies 19 and 21 being mounted on a punch plate 30 extending parallel to and above the base 31 and the punches for the dies 20 and 22 being carried by a punch plate 34 above and parallel to the base 32.

The punches and punch blocks of the dies are maintained in alignment by series of guide posts 35 and sleeves 36. A guide post 35 projects upwardly from each end portion of each base 31 and 32 and is received by a cooperating sleeve 36 projecting downwardly from each end of the punch plates 30 and 34. These guide posts and sleeves remain in more or less telescoped relation at all times, thus aligning the die blocks and the punches of the pair of dies to which they are related.

A common stripper is provided for each pair of dies, stripper 37 for the dies 19 and 21 and stripper 39 for the dies 20 and 22. The stripper 37 comprises a sheet metal member of generally U-shaped form having its legs secured to the base 31 of the dies and extending in parallel spaced relation upwardly beside and across above the cutting surfaces of the dies 19 and 21. The portion of the stripper 37 above the die block 24 and the corresponding die block of the die 21 is provided with holes 38 and 41, 41 (Fig. 9) of sufficient size to provide ample clearance for passage of the punches 27, 27 and 29 and likewise is provided with holes for passage of the corresponding punches of die 21 therethrough. To reinforce the portion of the stripper 37 extending above the die blocks, upwardly-extending flanges 40, 40 may be provided.

The stripper 39 is similar in construction to the stripper 37 and is secured to the base 32 so as to extend above the die blocks of dies 20 and 22. The vertical leg portions of the stripper 39 may be flared slightly at their front edge as indicated in Figs. 3 and 4 to aid in the insertion of the channel-shaped head bar within the dies. Each of these strippers functions in the same manner to limit the upward movement of the head bar 10 as the punches are withdrawn from the die blocks so as to strip the head bar from the punches and retain it adjacent to the die blocks so that it may be withdrawn from the dies.

A die shoe 42 is provided for slidably receiving the bases 31 and 32 of the dies, this die shoe comprising a horizontal plate extending completely beneath both bases. The die shoe 42 may be provided with side guides 44, 44 formed of a plurality of strips of metal extending parallel from front to rear of the shoe and slidably receiving the stepped lateral edges of the bases 31 and 32. The side guides 44, 44 also retain the bases against rising from the die shoe 42 when the punches are withdrawn from the dies. The arrangement of die shoe and bases is such that the die shoe 42 together with its guides 44, 44 permit the bases 31 and 32 to be slid from front to rear of the shoe while retaining the bases in parallel relation.

The punch plates 30 and 34 are slidably mounted on a punch-holding plate 45, this plate extending horizontally above both of the punch plates. Cap screws 47 passing through slots 49 extending in the punch-holding plate 45 from front to rear thereof (Fig. 10) and engaged in each end of each punch plate 30 and 34 serve to retain the punch plates in position. It has been found to be unnecessary to provide the punch-holding plate 45 with side guides to retain the punch plates 30 and 34 in parallel relation. The punch-holding plate 45 is provided with a conventional round upwardly-extending shank 62 (Fig. 10) for securing the plate to the ram 46 of a reciprocating press. Oil cups 33 may be provided in bores in the punch-holding plate 45 above the sleeves 36 to feed oil to felt pads 43 located within the sleeves for lubricating the sleeves and guide posts 35.

The dies 20 and 19 are mounted on the bases 32 and 31, respectively, aligned from front to rear to receive an end of the channel-shaped head bar 10. The dies 21 and 22 are similarly aligned for receiving the opposite end of the head bar. Hence, by inserting one end of the inverted head bar within the dies 19 and 20 and actuating the press, the end of the head bar is punched as indicated in Fig. 6 and by turning the head bar end for end and inserting the opposite end within the dies 21 and 22, the opposite end of the head bar is punched as indicated in Fig. 8.

The stops 50 and 51 are provided on the rear side of die block 24 of die 19 and the die block of die 21 (Figs. 5 and 7) to limit the rearward movement of the ends of the head bar 10 when it is inserted within the dies. Each of these stops comprises a short strip of metal secured to the rear face of the die block and projecting above the cutting surface thereof. When inserting the head bar 10 within the dies, it is slid rearwardly over the die blocks until the inserted end of the head bar contacts the stop 50 or 51 at which time the head bar is in position for punching. Stops 50 and 51 are not adjustable and the holes and tabs formed by dies 19 and 21 are formed a constant distance from the ends of the head bar.

Head bars of varying rout distance may be punched by adjusting the distance between the dies 19 and 20 and the dies 21 and 22. A threaded shaft 52 (Figs. 4 and 7) is provided for this purpose, the shaft 52 having right-handed threads formed on its front portion and left-handed threads formed on its rear portion. The shaft 52 runs from front to rear of the die 18 immediately above the die shoe 42. The right-hand threaded portion of the shaft 52 is threadedly engaged in the base 32 and the left-hand threaded portion is threadedly engaged in the base 31, so that, upon rotation of the shaft in one direction, one pair of dies is separated from the other pair and upon rotation in reverse direction the pairs of dies are converged. The shaft 52 is retained against longitudinal movement by a pair of spaced collars 54, 54 fixedly located on the shaft between the pairs of dies and on each side of an upwardly-opening saddle 55 secured to the die shoe 42 (Figs. 4 and 7).

This arrangement maintains the pairs of dies always centered relative to the ram 46 of the press and therefor aids in maintaining a more symmetrical loading of the dies.

The forward end of the shaft 52 may be provided with a socket 56 similar to the head of an Allen-type screw. A relatively small crank 57 is provided with a cooperating male portion for engaging the socket 56 in order to operate the shaft. The crank 57 may be retained captive on the dies 19 by a link 59 having one end pivotally secured to the forward edge of the die shoe 42 and the opposite end journaled about the shaft-engaging portion of the crank.

Bolts 60 (Fig 3) may be provided passing through slots 61 extending from front to rear in the die shoe 42, threadedly engaged in the bases 31 and 32, these bolts and slots being similar to the bolts 47 and slots 49 previously described in connection with the punch-holding plate 45 and the punch plates 30 and 34. The bolts 60 serve to hold the bases 31 and 32 tightly to the die shoe 42 to hold the dies 19 in fixed adjustment when the rout distance is not to be varied, these bolts supplementing the guides 44, 44.

The rout distance is adjusted by rotating the shaft 52 after slightly loosening the bolts 47 and 60. Rotation of the shaft 52 converges or separates the pair of dies as a unit together with their associated bases, punch plates and guides 35. In this manner, the rout distance for both ends of the head bar is adjusted simultaneously in the same amount by a single adjustment, helping to prevent errors in adjusting and assuring a completely uniform rout distance at both ends of the head bar.

A scale 64 may be mounted on one end of the punch plate 30 (Fig. 1) to extend forwardly beside the corresponding end of the punch plate 34. A pointer 65 mounted on the punch plate 34 indicates on a portion of the scale 64, graduated in inches, the rout distance for which the dies are set.

A support 66 projects forwardly from the dies 22 for supporting the free ends of the head bar 10 at the proper elevation for the stamping operation. This support comprises a pair of forwardly-extending members 67, 67 secured to the die shoe 42 and a horizontal-connecting member 69 connecting the forward ends of the members 67, 67 and so positioned that when a head bar 10 is supported on the member 69, in inverted position, the bottom wall of the head bar will lie in a plane continguous to the top surface of the die blocks.

A vertical guide 70 projects upwardly from the member 69 and is aligned with the space between the dies 20 and 22 to aid in positioning a head bar for the stamping operation. In stamping the right-hand end of the head bar 10, the head bar is placed in inverted position on the member 69 to the left of the guide 70 and the end of the bar inserted within the dies 22 and 21, the free end portion of the head bar being supported on the member 69 and resting against the left side of the guide 70. In stamping the left-hand end of the head bar 10, the head bar is placed in inverted position on the member 69 to the right of the guide 70, and the other end of the head bar is inserted within the dies 20 and 19, the free end portion of the head bar being held against the right face of the guide 70. The guide 70 serves to keep the free end of the head bar 10 aligned with the guides both horizontally and vertically and serves as a handy guide for insertion of the ends of the head bar within the dies.

The press 71 for holding and operating the die set 22 may be a conventional mechanical power press of five ton capacity. This press has a bed 72 to which the die shoe 42 may be bolted, the shank 62 of the punch-holding plate 45 being received by the ram 46 of the press. A trip lever 74 serves to control the operation of the press, depression of this lever resulting in a single stroke and return of the ram 46 so as to complete a single stamping operation of the dies 22. A receptacle 75 may be positioned adjacent the bed 72 of the press below the die set 18 to receive metal scraps and slugs.

I claim:

1. Sheet metal punching dies comprising two pairs of simultaneously operable dies, including die blocks and reciprocable punches, each pair of dies being carried by a separate base and punch plate and being relatively movable to adjust the distance between the pairs of dies, the corresponding dies of each pair being aligned for receiving an end of an elongated member and punching a plurality of holes therein in a single operation, and the two dies of at least one of the pairs being differently shaped so as to punch non-similar holes in the two ends of the elongated member, and means for accurately locating the ends of the member relative to the dies during the punching operations.

2. Sheet metal punching dies comprising two pairs of simultaneously operable dies, including die blocks and reciprocable punches, each pair of dies being carried by a separate base and punch plate and being relatively movable to adjust the distance between the pairs of dies, and telescoping guides for maintaining the die blocks and punches in alignment, the corresponding dies of each pair being aligned for receiving an end of an elongated member and punching a plurality of holes therein in a single operation, and the two dies of at least one of the pairs being differently shaped so as to punch non-similar holes in the two ends of the elongated member, and means for accurately locating the ends of the member relative to the dies during the punching operations.

3. Sheet metal punching dies comprising two pairs of simultaneously operable dies, including die blocks and reciprocable punches, each pair of dies being carried by a separate base and punch plate and being relatively movable to adjust the distance between the pairs of dies, and a die shoe and punch-holding plate mounting the bases and punch plates, respectively, the corresponding dies of each pair being aligned for receiving an end of an elongated member and punching a plurality of holes therein in a single operation, and the two dies of at least one of the pairs being differently shaped so as to punch non-similar holes in the two ends of the elongated member, and means for accurately locating the ends of the member relative to the dies during the punching operations.

4. Sheet metal punching dies comprising two pairs of simultaneously operable dies, including die blocks and reciprocable punches, each pair of dies being carried by a separate base and punch plate, a die shoe and punch-holding plate movably mounting the bases and punch plates, respectively, and means for moving each pair of dies equal amounts to adjust the distance between the pairs, the corresponding dies of each pair being aligned for receiving an end of an

elongated member and punching a plurality of holes therein in a single operation, and the two dies of one of the pairs being differently shaped so as to punch non-similar holes in the two ends of the elongated member, and means for accurately locating the ends of the member relative to the dies during the punching operations.

5. Sheet metal punching dies for punching an elongated metal member, said dies comprising a pair of simultaneously operable dies, including die blocks and punches, mounted side by side in spaced relation, a second pair of dies mounted behind and aligned with the first-mentioned pair of dies, and a support projecting forwardly from the dies for supporting the free end of elongated members inserted within the dies, said support having a member-supporting surface extending in front of the dies and a guide member projecting above the member-supporting surface intermediate its ends and aligned with the space between the dies, and the two dies of at least one of the pairs being differently shaped so as to punch non-similar holes in the two ends of the elongated member, and means for accurately locating the ends of the member relative to the dies during the punching operations.

6. Sheet metal punching dies for punching an elongated metal member, said dies comprising a pair of simultaneously operable dies, including die blocks and punches, mounted side by side in spaced relation, a second pair of dies mounted behind and aligned with the first-mentioned pair of dies, the two pairs of dies being relatively movable from front to rear to adjust the distance between the pairs of dies, and a support projecting forwardly from the dies for supporting the free end of elongated members inserted within the dies and the two dies of one of the pairs being differently shaped so as to punch non-similar holes in the two ends of the elongated member, means for accurately locating the ends of the member relative to the dies during the punching operations, said support having a member-supporting surface extending in front of the dies and a guide member projecting above the member-supporting surface intermediate its ends and aligned with the space between the dies.

7. Dies for punching the bottom wall of a sheet metal Venetian blind head bar channel, said dies comprising two pairs of simultaneously operable dies, including die blocks adapted to fit within the channel to support the bottom wall and cooperating reciprocable punches, each pair of dies being separately mounted and relatively movable to adjust the distance between the pairs of dies to vary the rout distance, the corresponding die blocks of each pair being aligned from front to rear to receive the channel in inverted position for punching a plurality of holes therein in a single operation, and the two dies of one of the pairs being differently shaped so as to punch non-similar holes in the two ends of the channel, and stop members adjacent one of the pairs of dies and engageable by the ends of the channel to limit insertion of the channel within the dies, the die blocks fitting closely between the side walls of the channel and, together with the stops, serving to accurately locate the ends of the channel during the punching operations.

8. Dies for punching the bottom wall of a sheet metal Venetian blind head bar channel, said dies comprising two pairs of simultaneously operable dies, including die blocks adapted to fit within the channel to support the bottom wall and cooperating reciprocable punches, separate plates mounting each pair of die blocks and the punches of each pair of dies, telescoping guides connecting the plate mounting the die blocks and punches of each pair of dies, and a die shoe and punch-holding plate slidably receiving the plates mounting the dies and punches to adjust the distance between the pairs of dies to vary the rout distance, the corresponding die blocks of each pair being aligned from front to rear to receive the channel in inverted position for punching a plurality of holes therein in a single operation, and the two dies of one of the pairs being differently shaped so as to punch non-similar holes in the two ends of the channel, and stop members adjacent one of the pairs of dies engageable by the ends of the channel to limit insertion of the channel within the dies, the die blocks fitting closely between the side walls of the channel and, together with the stops, serving to accurately locate the ends of the channel during the punching operations.

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