

- [54] TURRET PUNCHING MACHINES
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- [52] U.S. Cl. **83/552, 83/71, 83/140, 83/588, 83/699, 408/35**
- [51] Int. Cl. **B26f 1/04**
- [58] Field of Search **83/552, 549, 588, 140, 83/71, 699; 408/35; 29/39-47, 568**

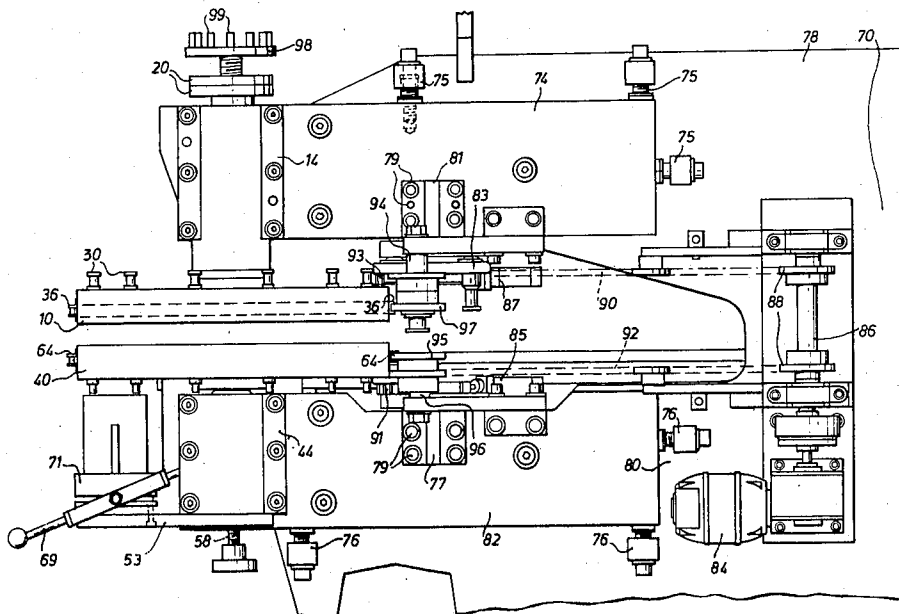
Primary Examiner—Frank T. Yost

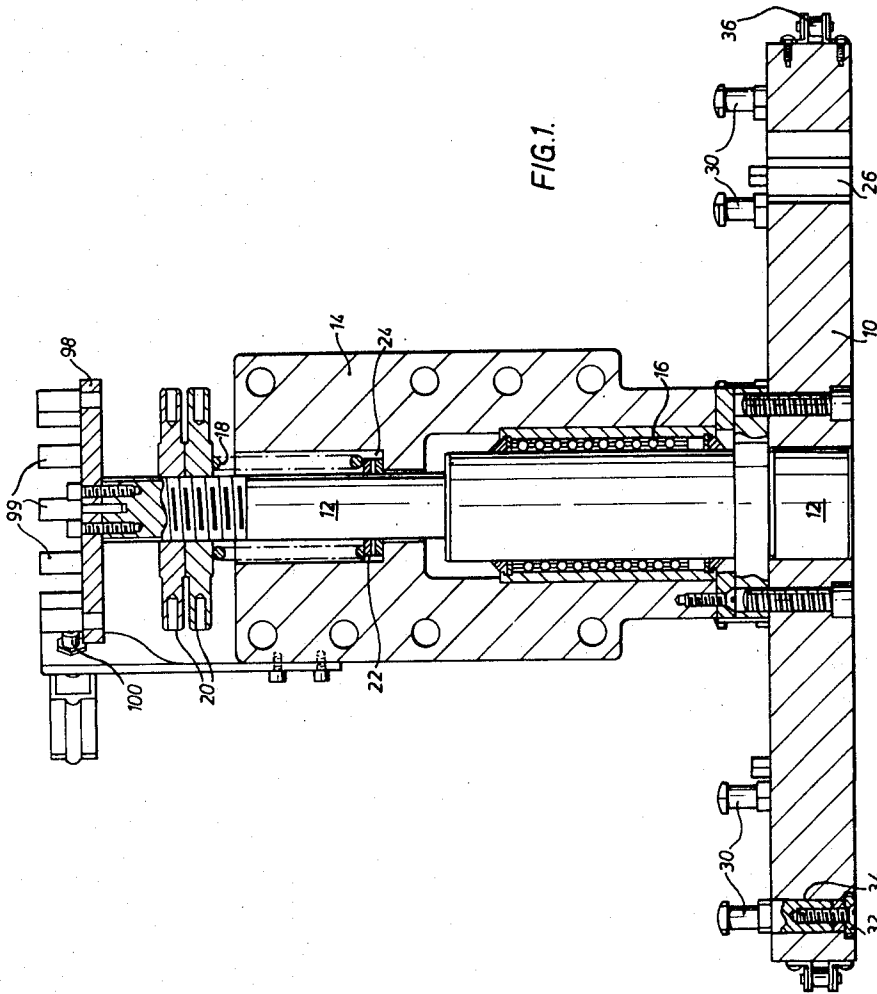
[57] **ABSTRACT**

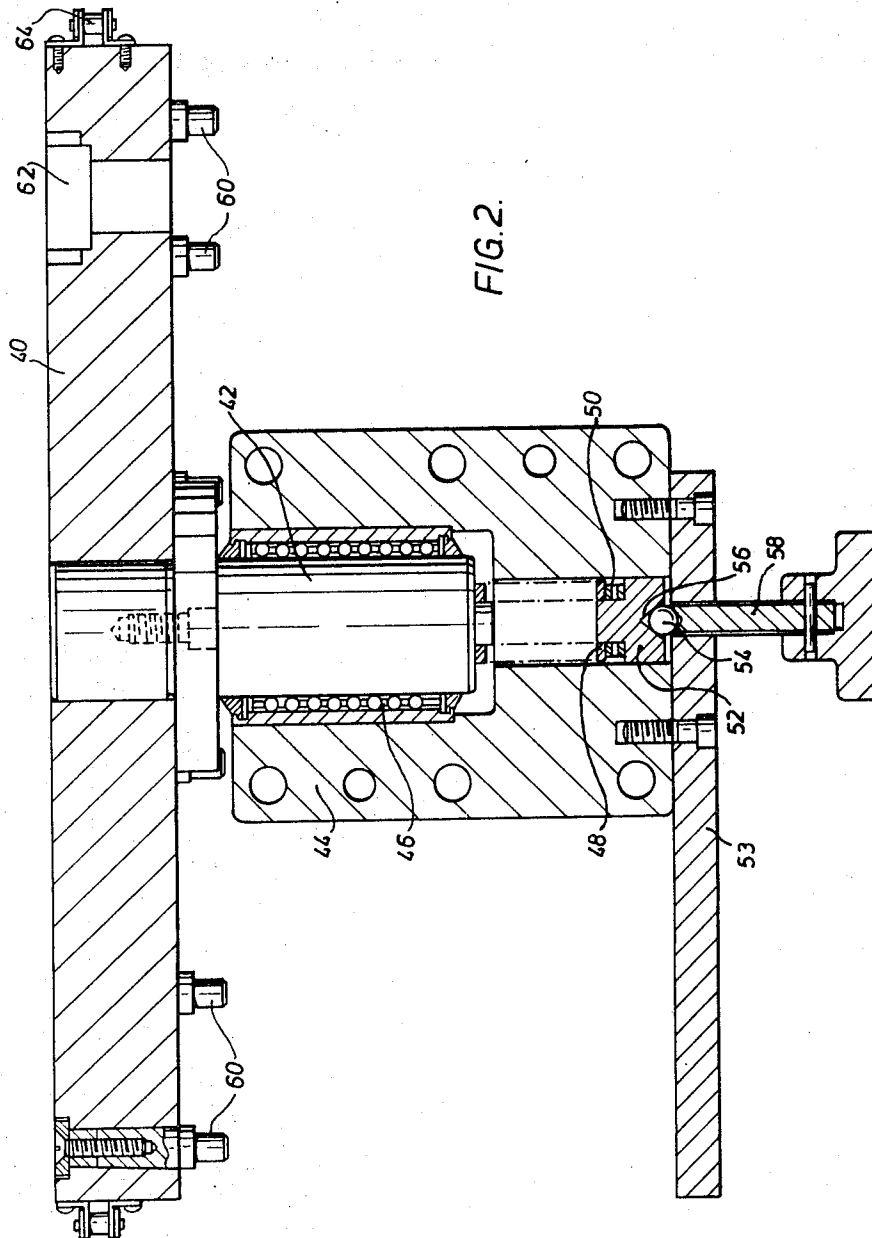
A turret punching machine has a frame consisting of spaced upper and lower limbs extending at right angles to the front edge of the machine, a spindle carrying a rotatable upper turret supported by the upper limb and being axially displaceable against a resilient force biasing it in the reverse direction, a ram mounted in the frame for axial movement and a rotatable lower turret the arrangement being such that the path of movement of the periphery of the turrets lies adjacent the front edge of the machine and that the punches carried by the upper turret during rotation of the turret move in succession below the ram which is disposed coaxially with and above an extreme laterally disposed punch station when viewed from the front of the machine.

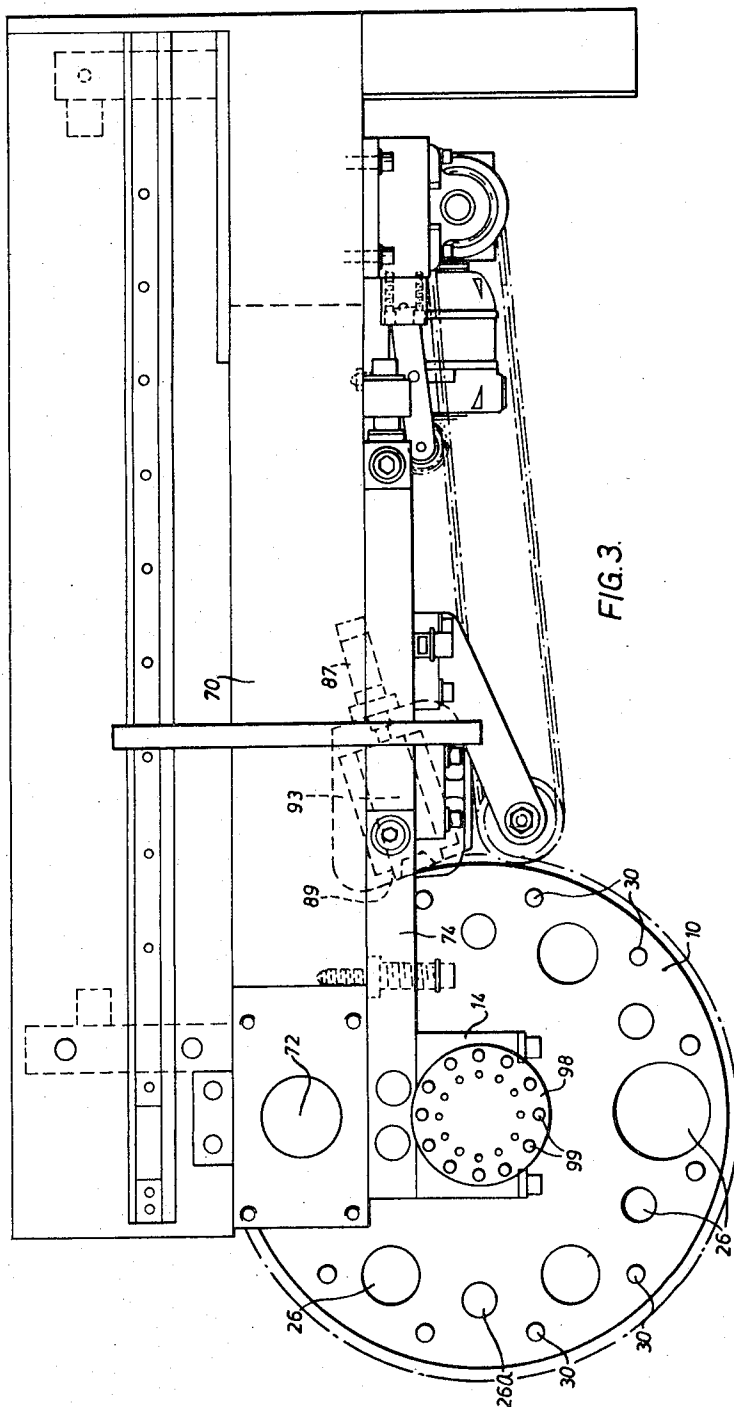
9 Claims, 6 Drawing Figures

- [56] **References Cited**
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- 3,165,962 1/1965 Bredow 83/552 X
- 3,745,646 7/1973 Kristiansson 83/552 UX









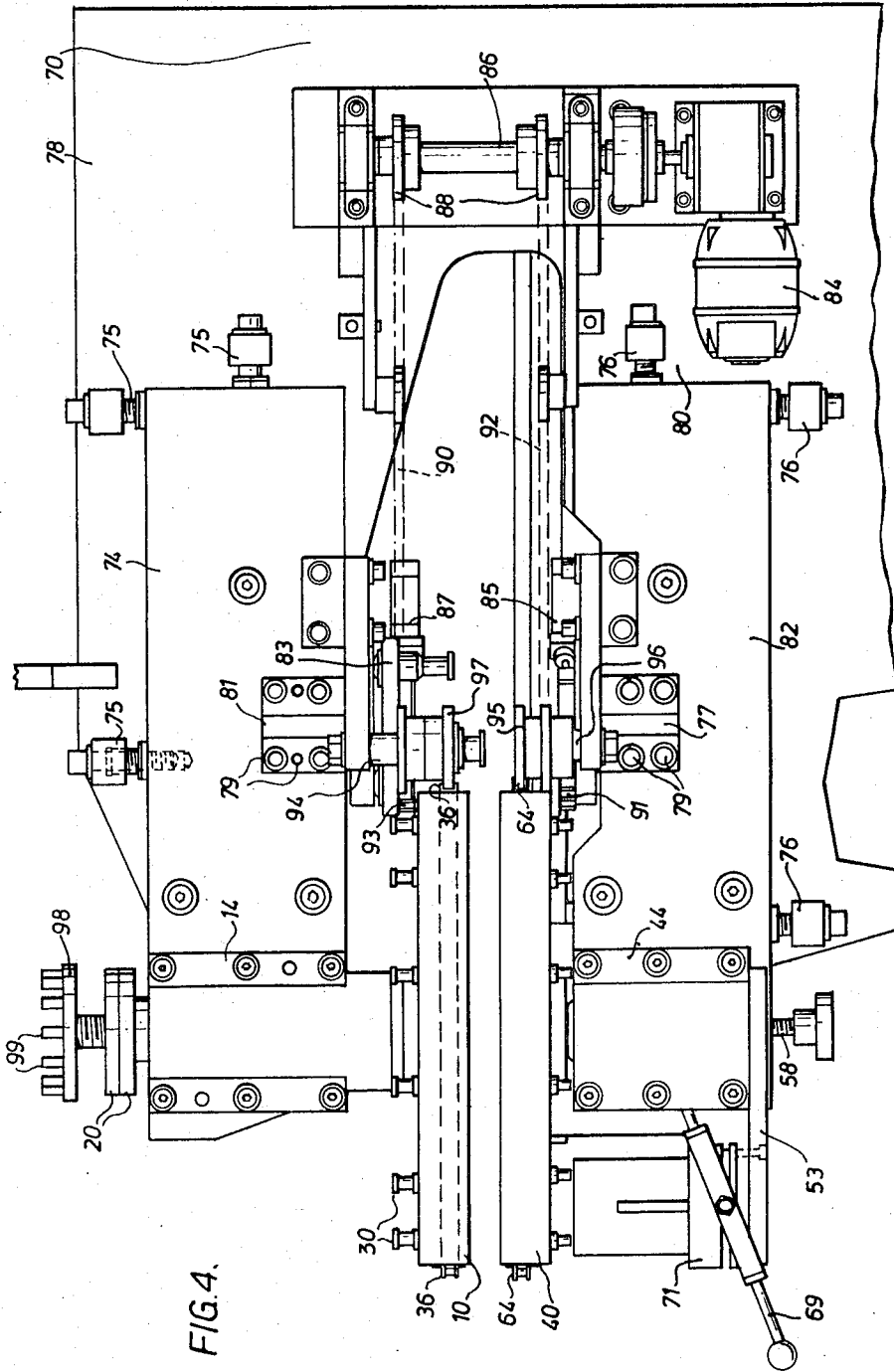


FIG. 5A.

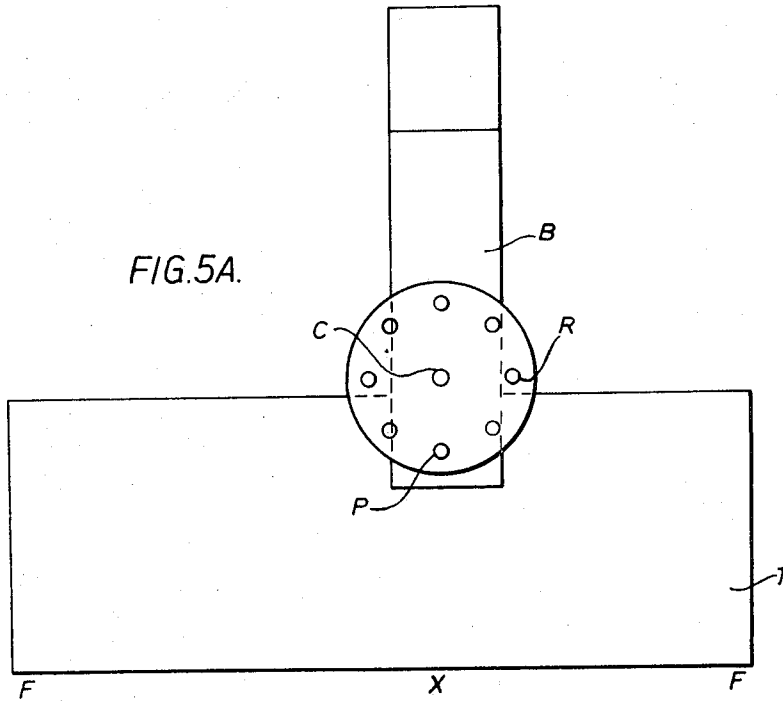
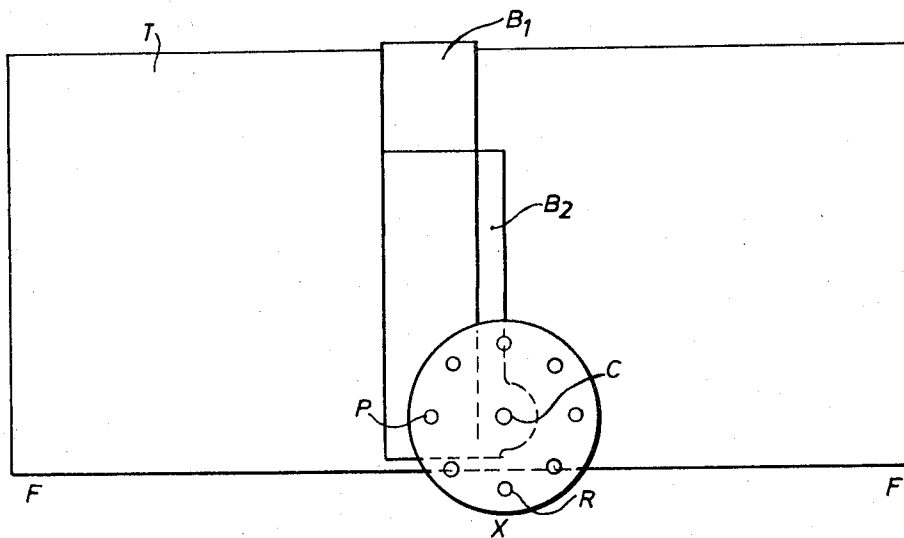


FIG. 5B.



TURRET PUNCHING MACHINES

FIELD OF THE INVENTION

This invention relates to turret punching machines having coaxially mounted turrets carrying punches and cooperating dies, respectively.

It is an object of this invention to provide a turret punching machine which facilitates the operation thereof as compared with existing machines and which produces high accuracy of punching operations.

SUMMARY OF THE INVENTION

According to one feature of the invention, a carrier for a turret supporting one or more punches is mounted to allow during punching operations, its displacement in a direction axially of the turret against a resilient force biasing it in the reverse direction.

The invention also includes a turret punching machine having a main frame extending substantially at right angles to the front edge of the machine and formed with spaced upper and lower limbs, a punch carrying rotatable turret supported by the upper limb of the frame and a ram mounted in the frame for axial movement, said turret and ram being so constructed and mutually disposed that the path of movement of the periphery of the turret lies at or adjacent the front edge of the machine, that the punches carried by the turret move in succession below the ram during rotation of the turret, and that the ram is disposed coaxially with and above an extreme laterally disposed punch station of the turret when viewed from the front of the machine.

A work table adapted for template duplication extends from side to side of the machine. A second turret carrying dies complementary to the punches of the first turret is rotatably supported by the lower limb of the frame and is rotated synchronously with the upper punch carrying turret during indexing.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be hereinafter described by way of example with reference to the accompanying drawings in which:

FIG. 1 shows an axial section of an upper punch carrying turret;

FIG. 2 shows an axial section of a lower die carrying turret;

FIG. 3 shows in plan view a turret punching machine constructed according to the invention;

FIG. 4 shows a side elevation of the same machine;

FIG. 5A is a diagrammatic plan view of a conventional punching machine; and

FIG. 5B is a diagrammatic plan view of a punch machine constructed in accordance with the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, a turret member 10 is secured to a spindle 12 rotatably mounted in a supporting bracket 14 through a bearing bush 16. The spindle 12 is axially displaceable relatively to the bracket 14 and is biased into its uppermost position by a spring 18 bearing against adjustable nuts 20 in threaded engagement with the upper end of the spindle 12 and at its lower end

against a thrust bearing 22 mounted in a recess 24 in the bracket 14.

The turret 10 as shown in FIG. 3 is formed with a plurality of apertures 26, in the illustrated example 12 of such apertures, which are of various diameters as shown and are adapted to receive guides for punches (not shown). Mounted to project from the upper face of turret 10 is a plurality of taper pins 30, one of which is shown in section in FIG. 1, and each of which is eccentric to its cylindrical boss 32 mounted so as to be rotatable within one or other of apertures 34 in the turret 10, thus enabling minor adjustments of the position of each pin 30 and consequently its related die aperture 26 to be made. The pins 30 are engaged by holding means after indexing of the turrets as hereinafter described.

Around its peripheral edge the turret 10 is provided with a roller chain drive 36 for rotating the turret into a desired angular position to bring a desired punch below the operative position of a ram actuating the same, as more fully described hereinafter.

The lower turret 40, carrying the dies which cooperate with the punches in the turret 10, is shown in FIG. 2. This is to a large degree an inversion of the turret 10 in that it has a spindle 42 mounted for rotation in a bracket 44 through a bearing 46. Spindle 42 is capable of slight axial movement relatively to the bracket 44 and is biased into its uppermost position by a spring 48 bearing against the lower face of the spindle and at its lower end supported through a thrust bearing 50 by a piston member 52 in turn supported on a bearing ball 54 held in a groove 56 in piston 52 by an adjustable stud 58 in threaded engagement with a plate 53 secured to the bracket 44.

In the same manner as in FIG. 1 the turret 40 has taper pins 60 projecting from its lower face, while apertures 62 in the turret 40 house dies (not shown) adapted to cooperate with one or other of the punches carried by the turret 10. Similarly, the peripheral edge of the turret 40 is provided with a roller chain drive 64.

FIGS. 3 and 4 show the turrets 10 and 40 mounted in their operative positions in the punching machine. A main frame 70 carrying a ram (now shown) the centerline of which is shown at 72, extends substantially at right angles to the front of the machine shown at the left hand edge of FIG. 3. The frame 70 is formed with spaced upper and lower limbs 78, 80, respectively, to which are rigidly secured one or more mounting blocks 74 and 82 respectively, which rigidly support the brackets 14 and 44 and other mounting assemblies. The exact location of the blocks 74 and 82 is determined by levelling or like screws and blocks 75 and 76, respectively. The block 74 to which the supporting bracket 14 is secured is so constructed and arranged that the centerline of the spindle 12 is located at the same distance from the centerline 72 of the ram (not shown) mounted in the main frame 70, as the radius of the circle containing the center of the apertures 26 struck from the center of the spindle, so that when the turret 10 is rotated the centerline of each aperture 26 passes successively below the centerline 72 of the ram. As will be noted from FIG. 3, the centerline of the ram is coaxial and above the extreme lateral punch in the aperture 26, that is the left hand punch when viewed from the front of the machine.

The lower turret 40 is mounted on the lower mounting block 82 coaxially with the turret 10. The rotational drive of the turrets for indexing purposes is effected by a motor 84 driving a shaft 86 carrying spaced sprockets 88 driving through chains 90, 92 sprockets 94 and 96. Sprocket 94 drives a sprocket 97 which engages the roller chain drive 36 of the turret 10 while the sprocket 96 drives a sprocket 95 which engages the roller chain drive 64 of turret 40.

When the turrets 10 and 40 are indexed to the correct position for the required punch to be operated by the ram, the turrets are held in such positions by slidable wedges 93, 91 having forked ends 89, as shown in dotted lines in FIG. 3, which ends engage the taper pins 30 and 60 and hold the turrets 10 and 40 against further rotation. The wedges 93, 91 are caused to slide by air under pressure from cylinders 87, 85 respectively. The wedge system for the turret 10 is mounted on a plate 83 which is free to move up and down with movement of the turret 10 in an axial direction.

As will be seen from FIGS. 1, 3 and 4 a disc 98 is secured to the upper end of the spindle 12 and carries a number of pins 99 corresponding to the punches in the upper turret 10 and the pins 99 operate a microswitch 100 which forms a simple means of programming the turret stations required during the punching operations.

The drive elements 94, 97 and the wedging assembly 93, 87 together with supporting plate 83 are carried by a bracket 81 secured to the upper mounting block 74 by dowels and screws 79. Similarly the members 85, 91, 95, 96 are supported by a bracket 77 secured to the lower mounting block 82, by dowels and screws 79. The brackets 77 and 81 assist in locating the lower and upper turrets respectively on the lower and upper limbs 80, 78.

The lower limb 82 also carries at the front of the machine a die ejector 71, manipulated by a handle 69, for ejecting the dies disposed in the apertures 62 of the lower turret 40. The replacement of the tools in the upper and lower turrets is effected at the respective turret station (26a in FIG. 3) nearest the front of the machine, which facilitates the replacement operation as compared with conventional turret punching machines wherein normally the work-table extends across and in front of the turrets, the centerline of the ram is coaxial with the stations nearest the front of the machine and the tools are replaced at the station angularly displaced by 90° counter clockwise from the punching station.

The lay-out of a conventional punching machine is shown in the diagram of FIG. 5A where F—F denotes the front of the machine, B the frame, C the axis of the turret spindle, P the centerline of the punching station (axis of the ram), T the work-table and X the position of the operator. As will be noted the operator has to stretch across the table to reach the punching station and has to walk substantially half-way round the table to effect tool replacement at R. Duplication by template is effected across the front of the machine.

In the lay-out of the machine shown in the diagram of FIG. 5B and constructed according to the invention, the length of the frame B₁, B₂ extends perpendicular to the front of the table, and over said table the spindle of the turret is mounted in the mounting block B₂, the punching station is at P and the replacement position R immediately adjacent the front F—F of the table. Any duplication from a template is carried out along

the table of the machine from left to right. This arrangement considerably facilitates the operation of the machine and allows quicker replacement of tools.

It is to be understood that the tools such as punches, guides and strippers and the dies in the lower turret may be of any suitable form. For example, the punch guides and strippers may be constructed as described in U.S. Pat. Specifications Nos. 1,075,993—4.

In operation, the punches and their complementary dies are mounted respectively in the upper and lower turrets at corresponding stations and the punch to be used is moved in to the punching station below the hydraulic ram mounted in the main frame. The ram is actuated to impact the punch and the pressure on the upper turret 10 causes the same to be displaced axially against the pressure of spring 22 until the punching guide (not shown) contacts the surface of the material being punched which is in contact with the upper face of the die. Further movement of the ram causes the punch to be advanced through the punching guide against the pressure of the stripping spring arrangement which acts between the head of the punch assembly and the head of the punching guide. The punch penetrates the material and in cooperation with the die causes the hole to be punched. Release of the ram pressure after punching produces the reverse movement firstly of the punch being stripped from the material under the action of the stripping springs and secondly permits the upper turret 10 to be displaced axially under the action of the spring 18 to release the material.

The incorporation of a sliding turret allows the use of a tooling system which strips the punch from the material without requiring any vertical movement of the material being worked on, or without the necessity of having members sliding in the plurality of apertures in the turret. This allows for reduced wear of these apertures and increases the effective life of the bores.

I claim:

1. A turret punching machine having a main frame extending substantially at right angles to the front edge of the machine and formed with spaced upper and lower limbs, a spindle carrying a rotatable upper turret supported by the upper limb of the frame and a ram mounted in the frame for axial movement, the said turret and ram being so constructed and mutually disposed that the path of movement of the periphery of the turret lies at or adjacent the front edge of the machine, that the punches carried by the turret move in succession below the ram during rotation of the turret and that the ram is disposed coaxially with and above an extreme laterally disposed punch station of the turret when viewed from the front of the machine.

2. A machine according to claim 1 wherein a work table adapted for template duplication extends from side to side of the machine.

3. A machine according to claim 1 wherein a second or lower turret, carrying dies complementary to the punches of the first turret, is rotatably supported by the lower limb of the frame and is rotated synchronously with the upper punch-carrying turret during indexing.

4. A machine according to claim 1 wherein the upper turret is secured to a spindle rotatably mounted in a supporting bracket through a bearing bush and wherein the spindle is axially displaced relatively to the bracket and is biased into its uppermost position by a spring

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bearing against a stop on the upper end of the spindle and at its lower end against a thrust bearing mounted in a recess in the bracket.

5 5. A machine according to claim 4 employing axially moveable indexing system capable of moving and cooperating with the turret to allow axial movement of the turret whilst maintaining accurate radial register to maintain a concentric relationship of recesses in the upper and lower parts respectively and consequently maintaining punch and die alignment.

10 6. A machine according to claim 3 wherein the lower turret has a spindle mounted for rotation in a bracket through a bearing, the spindle being capable of slight axial movement relatively to the bracket and being biased into its uppermost position by a spring (48) bearing against the lower face of the spindle and at its lower end supported through a thrust bearing by a piston member.

7. A machine according to claim 6 wherein the piston member is supported on a bearing ball held in a groove in the piston by an adjustable stud in threaded engagement with a plate secured to the bracket.

15 8. A machine according to claim 6 wherein the turrets are mounted in a main frame carrying a ram the centre line of which extends substantially at right angles to the front of the machine, the frame being formed with spaced upper and lower limbs to which are rigidly secured one or more mounting blocks which rigidly support the mounting brackets for the turrets and other mounting assemblies.

9. A machine according to claim 1 wherein the upper end of the spindle has a disc carrying a number of pins corresponding to the punches in the upper turret and wherein the pins are positioned to operate a micro-switch.

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