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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 3: B21D 28/12

A1

(11) International Publication Number: WO 81/02860

(43) International Publication Date: 15 October 1981 (15.10.81)

(21) International Application Number: PCT/GB81/00066

(22) International Filing Date: 10 April 1981 (10.04.81)

(31) Priority Application Numbers: 8011932
80304681.2 (EP)

(32) Priority Dates: 10 April 1980 (10.04.80)
22 December 1980 (22.12.80)

(33) Priority Countries: GB
FR et al.

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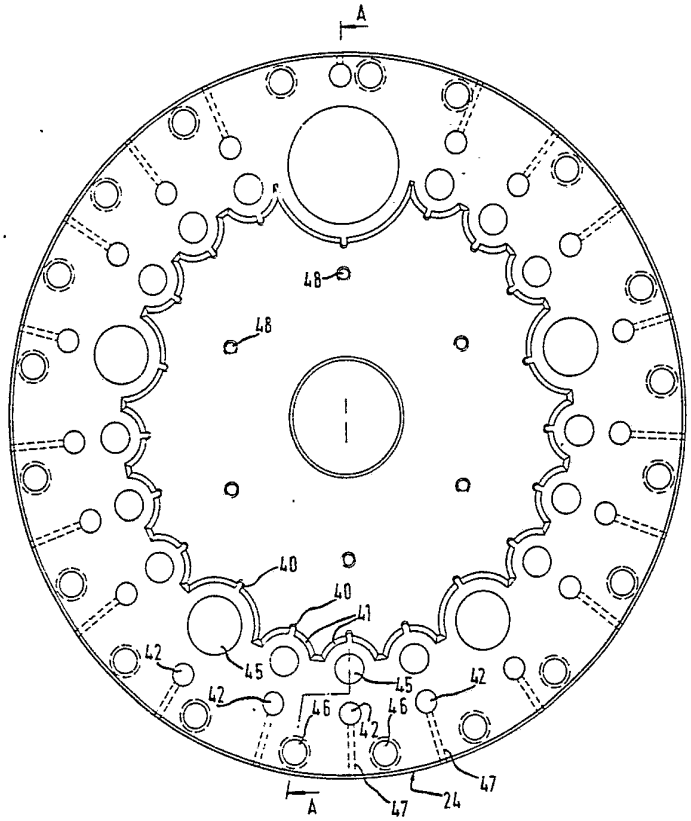
(81) Designated States: GB, JP, US.

Published
With international search report

(54) Title: IMPROVED TURRET

(57) Abstract

A turret (24) for forming the lower turret of a turret punch press has its circumference rebated with a scalloped configuration to provide a plurality of datum faces (41) against which a die assembly (30) may be received. The die assembly comprises a die holder (31), means (33, 38) for releasably securing the die holder (31) against a datum face (41) on the lower turret (24), and a die (34) releasably received within the die holder (31). By simply changing the die holder (31) different types of die tooling may be received by the same lower turret (24).



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"IMPROVED TURRET"

FIELD OF THE INVENTION

This invention relates to an improved turret for forming the lower turret of a turret punch press and to a turret punch press including such a turret.

BACKGROUND OF THE INVENTION

In punch presses incorporating turrets, such as in our British Patent No. 1420594, it has normally always been the practice for the lower turret forming a die holder for the dies to be formed with a plurality of holes of different sizes which receive the dies. However, such an arrangement means that the turret is not able to accept different types of die tooling.

SUMMARY OF THE PRESENT INVENTION

According to the present invention there is provided a turret for forming the lower turret of a turret punch press, the turret having its circumference rebated to provide a plurality of datum faces against which a die assembly in use may be received.

Preferably the turret has a scalloped configuration so as to receive a die assembly against an arcuate datum surface.

The invention also includes a turret punch press comprising a frame having an upper member and a lower member, an upper turret for punches supported by the upper member, and a lower turret for dies supported by the lower member, the lower turret having its circumference rebated to provide a plurality of datum faces against which a die assembly may be received.

The die assembly may comprise a die holder, means for releasably securing the die holder on the lower turret, and a die releasably received within the die holder.

Preferably the means for releasably securing the die holder which is cooperable with an angularly movable, eccentric locking head of a retainer on the turret.

The die holder may include an O-ring for engaging the die and retaining it by a friction fit.

The main advantage of the present invention is that the lower turret no longer determines the shape of die to be received. Thus, by changing the die holder, which serves as an adaptor, different types of die may be received on the same turret whereas previously only tooling specially designed for a particular machine could be used.

BRIEF DESCRIPTION OF THE DRAWINGS

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

Figure 1 is a side elevation of a punch press having a C-shaped frame with the workpiece positioning assembly omitted for clarity;

Figure 2 is a plan view of the lower limb of the punch press shown in figure 1 with the lower turret shown diagrammatically and partially broken away but including the workpiece positioning assembly;

Figure 3 is a side elevation of a preferred die assembly;

Figure 4 is a plan view of a preferred lower turret; and

Figure 5 is a section on A-A of figure 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawings a punch press comprises a frame 1 of C-shape, having upper and lower limbs 2 and 3 defining a throat 4. A workpiece positioning assembly (figure 2) on the press for supporting a sheet workpiece for two dimensional displacement relative to a punch station of the punch press comprises a first traverse 5 forming the Y-axis fixed to the frame 1 and a second traverse 6 forming the X-axis supported for movement along the Y-axis traverse 5.

The Y-axis traverse 5 comprises two horizontally-spaced rails 7,

one secured to each side of the lower limb 3 of the punch press frame 1. Extending parallel to the rails 7, and secured on one side only of the lower limb, is a leadscrew 8 driven, via a belt connection 9, by a DC Servo Motor 10. The rails 7 are not secured directly to the frame but, as shown, are disposed on an intermediate mounting member 11 and these extend forwardly and rearwardly from the back of the throat 4 as clearly seen from figure 2.

The X-axis traverse comprises an elongate beam 12 of U-shaped cross-section and having a lattice of cross-ties 13 for strength. Secured along the lower front edge of the beam 12 is a single bearing rail 14 for supporting a workpiece carriage 15. The workpiece carriage 15 includes two workpiece clamps (not shown) and is movable along the second traverse by means of a driving connection with a driven leadscrew 16.

As seen from figure 2 the driven leadscrew 16 is also driven by a DC Servo Motor 17 via a belt connection 18. The belt connections 9 and 18 enable the respective motors 10 and 17 to be positioned alongside the respective leadscrews rather than at one end thereby producing a more compact arrangement.

Extending rearwardly from the main beam 12 of the X-axis traverse are two support extensions 19 which engage with the rearward extensions of rails 7 and enable the traverse to be withdrawn right to the back of the throat whilst maintaining rigidity.

Although the workpiece positioning assembly described is preferred and is the subject of our copending European Application No. 80304681.2 the present invention is applicable to a turret punch press having any form of suitable workpiece positioning assembly. Thus, the X and Y axes may each include two parallel vertically spaced tracks as disclosed in our prior British Patent No. 1563921. Alternatively the Y-axis traverse could be mounted upon the upper limb of the frame 1. Moreover, although leadscrews 8 and 16 have been illustrated by way of example, rack and pinion drive means may be provided if desired - see for example U.S. Patent No. 3563123.

Referring once again to figure 1 it will be seen that the free end of the upper limb 2 supports a hydraulic ram assembly 50 and an upper turret 21. The hydraulic ram assembly 50 is supplied with hydraulic fluid from a reservoir (not shown) and flow is controlled by a hydraulic manifold 51. The hydraulic fluid passes to the ram assembly 50 through hydraulic pressure pipe 52 and fluid returns on ram retraction through pipe 53.

The upper turret 21 is provided with roller chain drive 22 for rotating the turret into a desired angular position to bring a desired punch below the operative position of the hydraulic ram assembly 50. The workpiece may be locked in position for clamp reposition by means of a pair of retractable clamping mechanisms 23 (only one shown) the operation of which is controlled by reposition solenoid 54.

Disposed below the upper turret 21,on the lower limb 3, is the lower turret 24 shown in detail in figures 4 and 5. The lower turret 24 also has a roller chain drive 25 and the two chains are connected to a common turret drive shaft 55 driven by a single drive motor 56 so that the movement of the two turrets are synchronised: a turret clutch/brake for the drive shaft 55 is provided at 57.

Disposed at the front of the machine, and on each of the upper and lower limbs 2 and 3, are respective upper and lower turret wedge assemblies 58, 59. The wedge assemblies 58, 59 each of which include a reciprocal locking member 60 operated by turret wedge solenoid 61. In order to determine the position of the locking member 60 respective pairs of wedge sensors 62, 63 are provided on the upper and lower limbs. The wedge assemblies 58, 59 lock the respective turrets in position after indexing a desired punch station by engaging location pins (not shown) on the turret so that, during punching, the turrets are accurately positioned relative to the hydraulic ram assembly 50. The locking member 60 engage one of a plurality of bull-nosed location pins in the respective turret as explained more fully below. Also shown in figure 1 are sheet clamp solenoid 64 and datum pin solenoid 65, neither the workpiece clamps nor the reciprocal datum plunger being shown in the drawings, the datum plunger being positioned on the other side of the lower limb 3 from that shown in figure 1.

The construction of the preferred die assembly is shown in figure 3.

The assembly 30 comprises a die holder 31 having two laterally projecting location pins 32 set at 90° (only one shown) and a locking groove 33. The holder 31 receives a die 34 having a location pin 35 locating in one of four location slots 36 and retained in position by frictional engagement with an O-ring 37 in the die holder 31. The location pins 32 are offset from the location slots 36 by 45° so that adjustment at 45° intervals is possible with only four slots.

In order to prevent upward lifting of the die holder 31 a retainer 38 is provided which has an eccentric locking head 39 for engagement with locking groove 33. The die holder 31 is designed to be received in the scalloped lower turret 24 (see figures 4 and 5), the die holder being located by one of pins 32 being positioned in a slot 40 in a datum face 41 of the respective turret station. In use the slot 40 is closed vertically by means of a permanently set grub screw (not shown). The retainer 38 is loosely received in an aperture 42 in the turret and has a vertical slot (not shown) joining peripheral groove 43. The vertical slot and groove 43 cooperate with a locking pin 44 in the aperture 42 to allow removal of the retainer only when the locking head is released ie: angular movement of the retainer 38 to release the locking head 39 from the groove 33 enables the locking pin for the retainer to be aligned with the vertical slot.

As seen from figures 4 and 5 the lower turret, in addition includes holes 45 for pinched slugs to drop through and holes 46 for the location pins

(not shown) to accurately orientate the turret - equivalent location pins being provided on the upper turret also: the pins being held in the holes 46 by tapered bushes also not shown. The locking screws 44 pass through holes 47 in the periphery of the turret.

Equidistantly spaced about the lower turret 28 (and the upper turret also although not shown) are six fixing holes 48 by means of which the respective turrets are mounted.

The arrangment of the lower turret means that by simply changing the die holder 31 different types of die tooling may be received whereas before only custom-made tooling could be accommodated. Although the datum faces 41 are preferably arcuate it will be understood that they may be of any other configuration, the die holders 31 being suitably contoured as necessary.

CLAIMS

1. A turret for forming the lower turret of a turret punch press characterised in that the turret (24) has its circumference rebated to provide a plurality of datum faces (41) against which die assemblies (30) in use may be received.

2. A turret according to claim 1 characterised in that the circumference of the lower turret (24) has a scalloped configuration so as to receive a die assembly against an arcuate datum surface (41).

3. A turret punch press comprising a frame (1) having an upper member (2) and a lower member (3), an upper turret (21) for punches supported by the upper member (2), and a lower turret (24) for dies supported by the lower member (3) characterised in that the lower turret (24) has its circumference rebated to provide a plurality of datum faces (41) against which die assemblies (30) may be received.

4. A turret punch press according to claim 3 characterised in that the circumference of the lower turret (24) has a scalloped configuration so as to receive a die assembly against an arcuate datum surface.

5. A turret punch press according to claim 3 or 4 including a die assembly (30) characterised in that the die assembly comprises a die

holder (31), means (33,38) for releasably securing the die holder against a datum face on the lower turret, and a die (34) releasably received within the die holder.

6. A turret punch press according to claim 5 characterised in that the means for releasably securing the die holder on the lower turret (24) comprises a groove (33) on the die holder which is cooperable with an angularly movable, eccentric locking head (39) of a retainer (38) on the turret.

7. A turret punch press according to claim 5 or 6 characterised in that the die holder (31) is circular, has two protruding location pins (32) set at 90° to one another for cooperation with a datum face of the lower turret, and four equally-spaced location slots (36) offset by 45° from said pins, and the die (34) has one location pin (35) for cooperation with the location slots in the holder, adjustment of the location pins enabling the die to be set angularly at intervals of 45°.

8. A turret punch press according to any of claims 3 to 7 characterised in that the periphery of the lower turret (24) is formed with a plurality of holes (46) each of which receives a location pin which may be engaged by a reciprocal locking member (60) on the lower member (3) of the frame (1) to lock the lower turret in position during punching.

9. A turret for a turret punch press arranged as shown in figure 4.

FIG. 1.

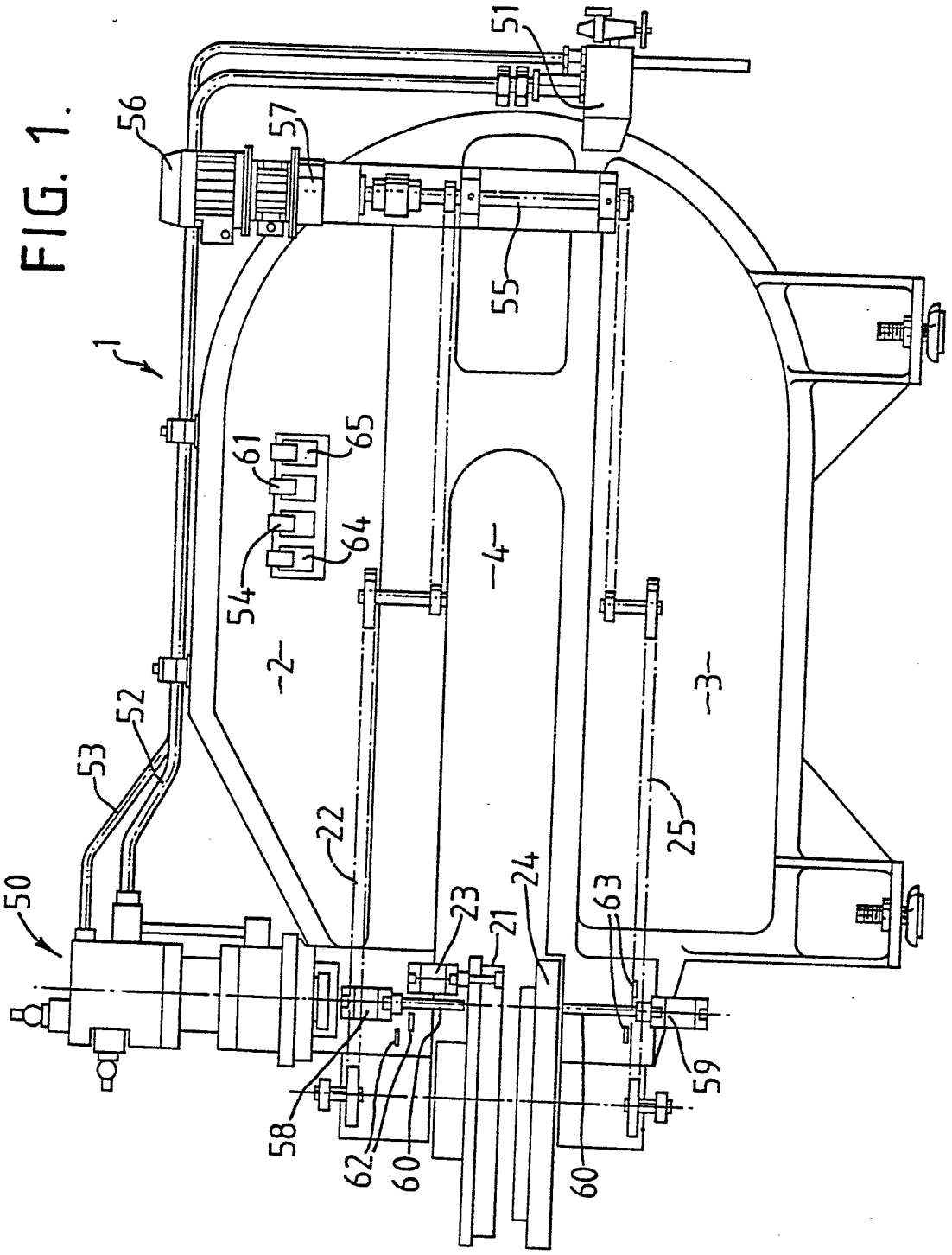


FIG. 2.

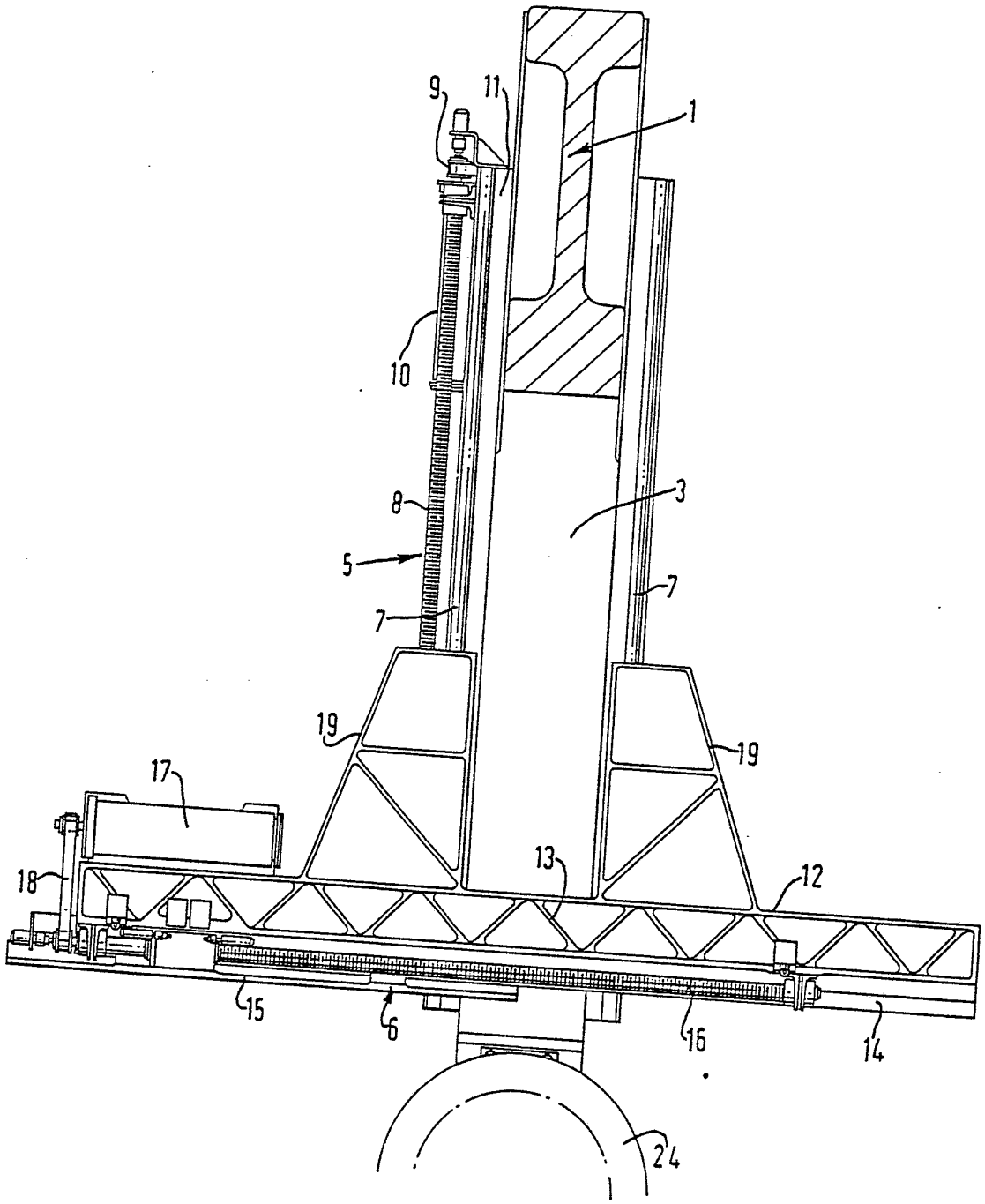


FIG. 3

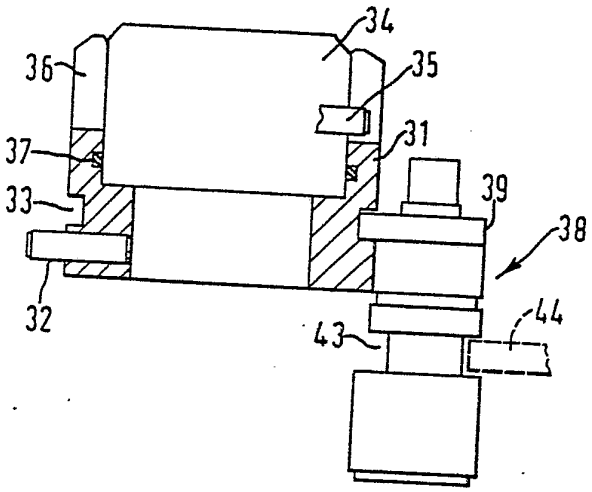


FIG. 5.

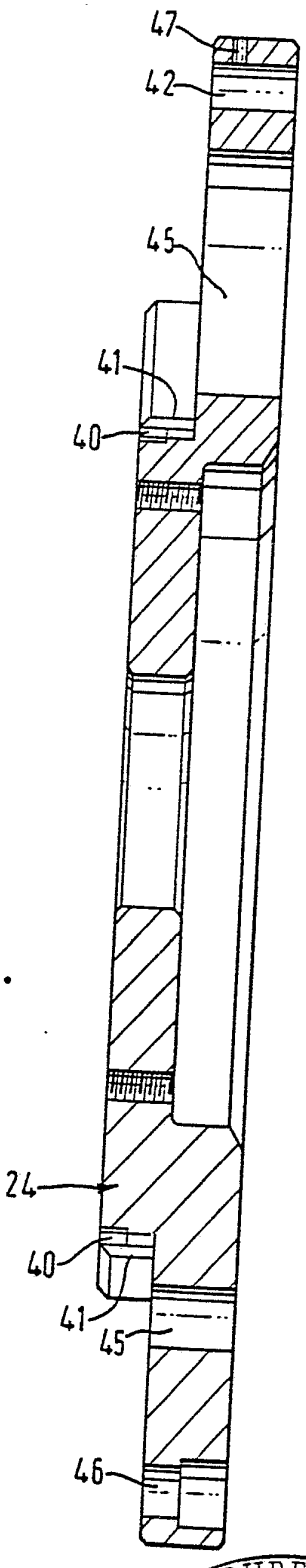
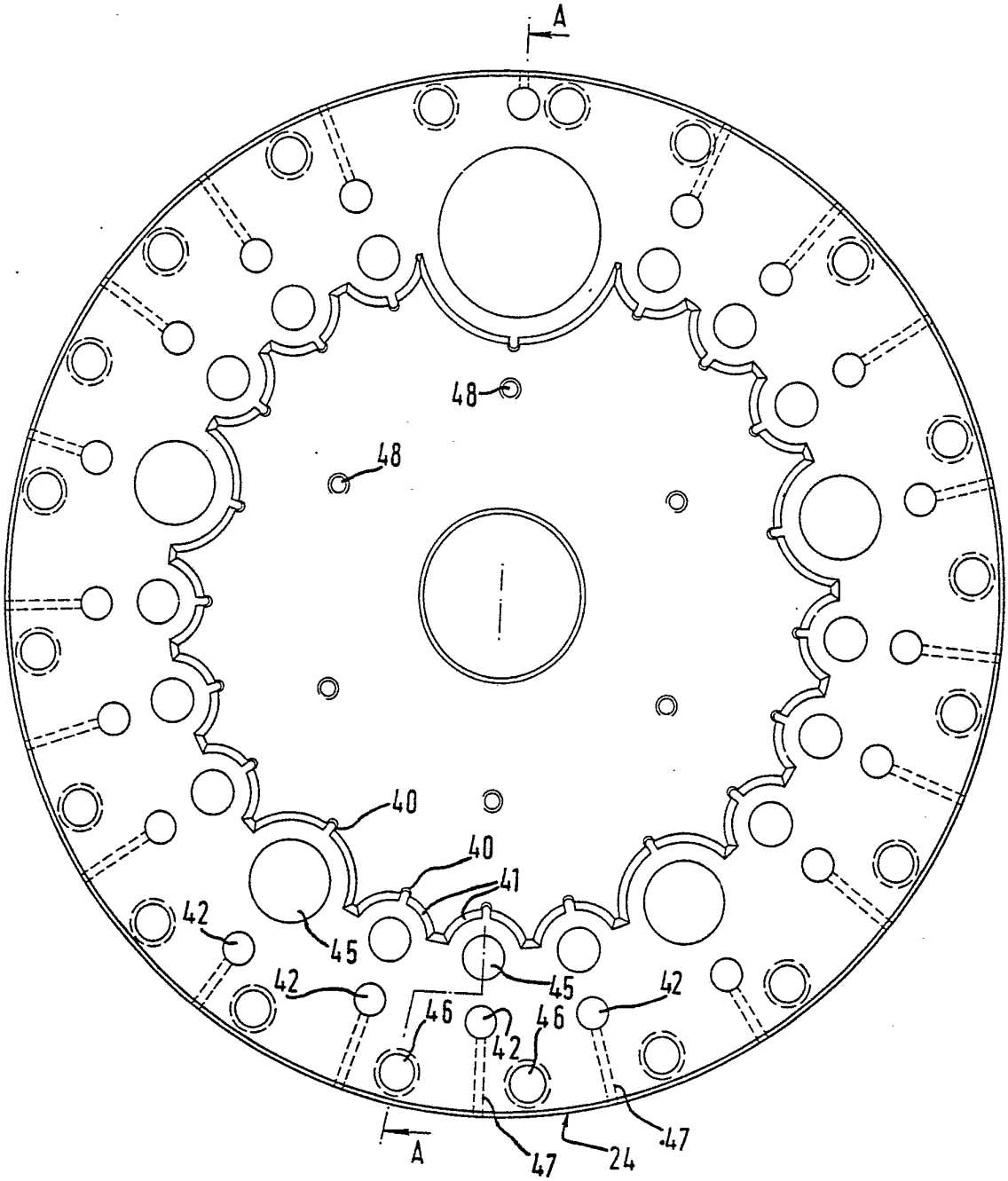


FIG. 4.



INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 81/00066

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) 3

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl.3 B 21 D 28/12

II. FIELDS SEARCHED

Minimum Documentation Searched 4

Classification System	Classification Symbols
Int.Cl.3	B 21 D

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 5

III. DOCUMENTS CONSIDERED TO SE RELEVANT 14

Category *	Citation of Document, 16 with indication, where appropriate, of the relevant passages 17	Relevant to Claim No. 18
	GB, A, 1183871, published March 11, 1970 see page 10, lines 15-97; figures 9 and 10, Houdaille Industries corresponding to US, A, 3440587 US, A, 3449991 NL, A, 6805060 FR, A, 7559515 DE, A, 1763135 DE, A, 297144 CH, A, 466867	1-5
	US, A, 4096774, published June 27, 1976 see column 7, lines 33-68; column 8, Houdaille Industries corresponding to CD, A, 1066183 CD, A, 1092018	1-5
	US, A, 4165669, published August 28, 1979 Houdaille Industries	1-5
A	GB, A, 1420594, published January 7, 1976 Pierce-All Manufacturing Limited	1

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"X" document of particular relevance

IV. CERTIFICATION

Date of the Actual Completion of the International Search 3	Date of Mailing of this International Search Report 3
13th July 1981	22nd July 1981

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EUROPEAN PATENT OFFICE Branch at The Hague P.O.Box 5818 Patentlaan ,2 2280 HV RIJSWIJK (ZH) The Netherlands	G.L.M. Kruydenberg