

[54] MEANS FOR SECURING AN INSERT TO A BASE PIECE

[72] Inventor: Nello J. Petri, San Francisco, Calif.
 [73] Assignee: Petri-Johnson, Inc., San Jose, Calif.
 [22] Filed: March 10, 1971
 [21] Appl. No.: 122,947

[52] U.S. Cl.287/20.3, 287/52.08, 279/30
 [51] Int. Cl.F16b 1/00
 [58] Field of Search83/698; 279/30, 83, 76;
 287/52.08, 20.3; 299/92

[56] References Cited

UNITED STATES PATENTS

2,416,285	2/1947	Buckingham.....	279/83 X
662,996	12/1900	Wood.....	279/83 X
2,167,014	7/1939	Verderber.....	279/83
3,036,839	5/1962	Williamson.....	279/76 X
1,647,802	11/1927	Josef.....	287/52.08
2,431,566	11/1947	Kopczynski.....	83/698 X
2,437,740	3/1948	Haynes.....	279/83 X

Primary Examiner—Andrew V. Kundrat
 Attorney—Gordon Wood

[57] ABSTRACT

Means for removably securing an insert element to a larger base piece. The invention as disclosed solves the problem of securing an insert element such as a punch to a larger base piece such as a punch ring. The invention is particularly applicable to a rotary punch of the type having a rotating punch ring with punch elements removably secured around the periphery of said ring. In lieu of the usual set screw method of securing the punches to the punch ring quick releasable means is provided for fixedly but removably securing the shank of a punch or the like within a bore in the punch ring. The cross sectional contour of the shank or the bore is formed so that the shank engages the bore at two points in cross section. The shank is forced against said two points by means of a spring pressed ball so that the insert is urged simultaneously against the bottom of the bore and against the two points. The "three point support" thus achieved insures not only optimum stability of the insert with respect to the punch ring but also permits extremely accurate positioning of the punch relative to the punch ring.

3 Claims, 5 Drawing Figures

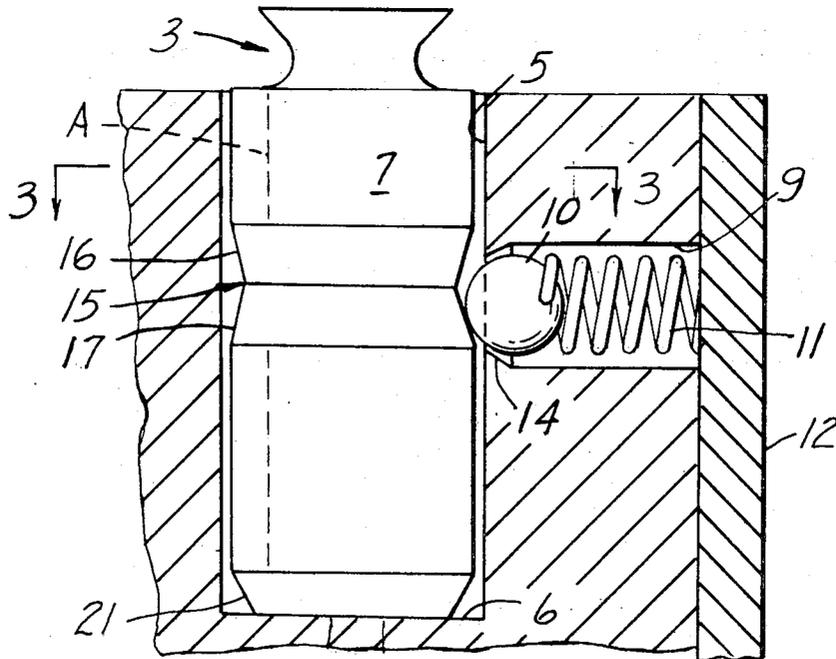


Fig. 1.

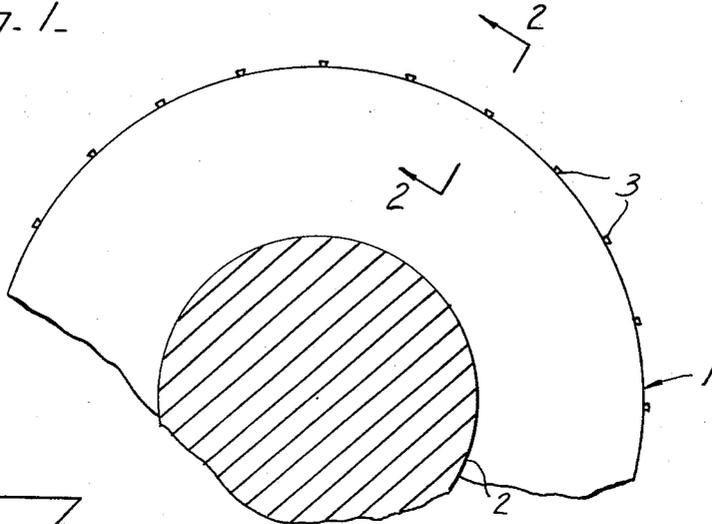


Fig. 2.

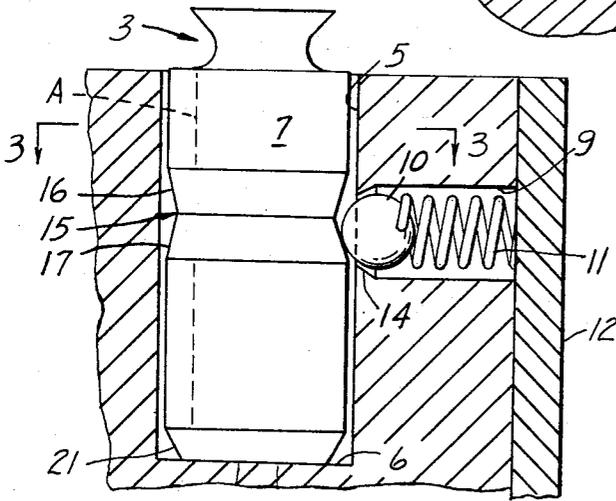


Fig. 4.

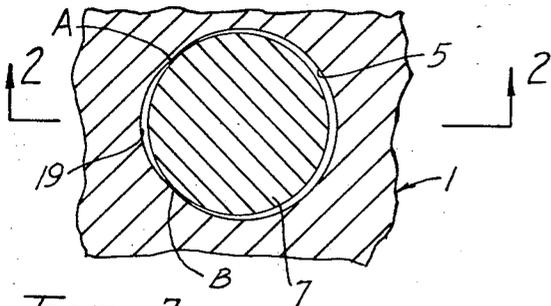
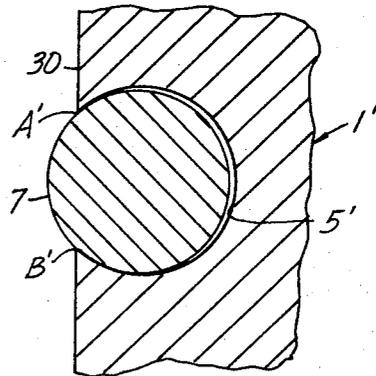


Fig. 5.

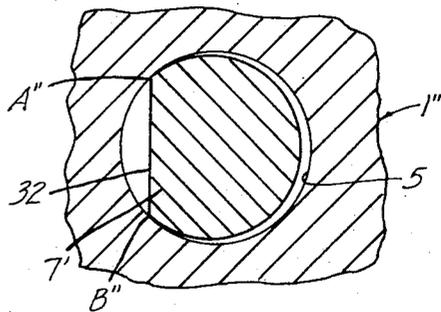


Fig. 3.

INVENTOR
NELLO J. PETRI
BY
Gordon Wood.

MEANS FOR SECURING AN INSERT TO A BASE PIECE

This invention relates to means for accurately and firmly positioning a replaceable element with respect to a larger member or base piece. The invention will be described with respect to replaceable punch elements which are inserted in the periphery of a rotatable punch ring for the purpose of punching holes in a paper strip or the like. However it will be apparent that the invention herein disclosed is applicable to many other situations wherein it is desired to fixedly secure an element with respect to a base piece so that such element may be removed and a similar element replaced with a minimum loss of time.

Heretofore paper punches of the type which include a ring rotatably supported relative to a moving web of paper have been provided with replaceable punches which are fixedly secured in radially outwardly opening bores in the ring periphery. In order to fixedly secure said punches relative to the ring the procedure in the past has been to employ a set screw threadedly secured within the ring and which screw may be tightened against the shank of the punch. Since such punches must be replaced quite frequently it has been a time consuming operation to release each one of the screws securing the punch elements and then tighten such screws after the new punch elements have been replaced. The reason for employing such screw means for holding the punch elements is that a high degree of accuracy is desired in punching apparatus and the set screws provide means for not only holding the punch element in a fixed position with reference to the punch ring bore but, since the punch element is urged against one side of the bore a high degree of accuracy is ensured.

The main object of the present invention is the provision of means for fixedly securing punch elements within the periphery of a rotatable punch ring without the use of set screws and similar devices requiring manual loosening and tightening.

Another object of the invention is the provision of a relatively simple holding device which not only secures the removable element in place relative to the base piece but also insures a high degree of accuracy in locating the element relative to the bore within which it is received thus adding to the life of the punch.

Other objects and advantages will be apparent from the following specification and from the drawings:

FIG. 1 is a fragmentary side view of a punch ring showing a plurality of punch elements in the periphery thereof.

FIG. 2 is a greatly enlarged cross sectional view of the punch ring showing the insert in place and the holding means therefor.

FIG. 3 is a transverse cross sectional view through the bore showing the shank or the punch element received therein. The clearance between the shank of the punch element and the bore in which it is received is greatly exaggerated for clarity.

FIG. 4 is a view similar to FIG. 3 showing a modified form of the invention.

FIG. 5 is a view similar to FIG. 3 showing another modified form of the invention.

In detail, and first with reference to FIG. 1, the invention will be disclosed with reference to a punching apparatus for punching holes in a web of paper or the

like. Such an apparatus includes a punch ring generally designated 1 carried by a shaft 2 which is rotatably supported in suitable bearings (not shown). Upon rotation of the ring 1 over a moving web of paper the punches 3 on the periphery thereof cooperate with dies on a die ring (not shown) to punch holes in the paper at predetermined spaced points along the length of the latter. After a period of use the punches 3 become worn and must be replaced. Although such replaceable punches are relatively inexpensive the operation of removing the old punches and replacing them with new ones is a time consuming one since it is required to release and tighten set screws for holding such elements in place. The present invention is not concerned with the punching operation itself but is concerned merely with the step of removing the old punch elements and replacing them with new ones.

As best seen in FIG. 2 the periphery of ring 1 is provided with a plurality of radially extending outwardly opening bores 5 each of which is provided with a bottom 6. The punch generally designated 3 is provided with an elongated shank portion 7 which may be a few thousandths of an inch less in diameter than the diameter of bore 5. On one side of the bore 5 a transversely extending opening 9 is drilled to receive a ball 10 and a strong compression spring 11. All of the springs may be secured in place by a single annular spring retainer 12 fixed to ring 1 by bolts (not shown). The spring 11 urges the ball 10 toward the adjacent side of the shank 7 and the inner end of hole 9 may be made frustoconical or spherical as indicated at 14 to retain the ball within the hole 9 when the shank 7 is removed.

The ball 10 cooperates with a V-shaped groove 15 extending around the periphery of shank 7 and having a pair of straight intersecting sides 16, 17. As seen in FIG. 2 the length of shank 7 and the location of hole 9 is predetermined so that the ball 10 engages the camming surface 17 thus urging the inner end of shank 7 against the bottom 6 of the bore. The force of the spring 11 also urges the shank 7 against the side of the bore 5 that is opposite the ball 10. As best seen in FIG. 3 said opposite side of the bore 5 is enlarged, preferably by milling, as indicated at 19. The depth of such enlargement 19 need not be very great but merely sufficient to cause the shank 7 to engage the inner side of the bore 5 along lines A and B (FIG. 3) extending longitudinally of the bore. By this structure it will be apparent that the shank 7 is subjected to a "three point support" in the sense that the ball 10 and the lines of engagement A, B are the only external means in engagement with the punch shank 7 (neglecting the effect of the bottom 6 of the bore on the inner end of the shank). It will be understood that the clearances between the shank 7 and the bore 5 and the enlargement 19 are exaggerated in FIG. 3 for clarity. Actually in practice only a few thousandths of an inch clearance is required between the shanks 7 and the bore 5 in order to simplify the insertion and removal of the shank 7 relative to the bore 5.

It has been found that the desired stability of the shank 7 relative to the drum 1 cannot be achieved merely by urging the shank against the opposite cylindrical side of the bore 5. In other words if the lines of engagement indicated at A and B are not clearly defined as by providing the enlargement 19 the shank 7

tends to rock within the bore 5 thus making it impossible to keep the punch located with the desired degree of accuracy.

The inner end of the shank 7 may be tapered as indicated at 21 to facilitate the insertion of the shank within the bore.

The "three point support" noted above is of course actually brought about by the engagement of the shank 7 along two lines and the point at which the ball 10 engages the camming surface 17. Thus the term "three point support" as used herein is not exactly accurate but describes the important principle that by engaging the shank 7 at three different locations optimum stability is achieved. The efficacy of the structure is further enhanced by the presence of groove 15 which divides each of the lines of engagements A, B into two spaced parts so that there are, in effect, four lines of engagement on one side and point engagement on the opposite side.

Another form of the invention which also provides the so called "three point support" is shown in FIG. 4 wherein the ring 1' is provided with a side 30 spaced from the center line of the bore 5' a distance less than the radius of the latter so that the bore breaks out through said side 30. By this structure the shank 7 engages the inner side of the bore at points A' and B' thus achieving a comparable stable support for the shank 7.

An analogous structure is shown in FIG. 5 wherein the ring 1'' is provided with a bore 5 of circular cross section and the shank 7' is formed to provide a flat 32 along the side opposite the side engaged by the ball 10. By this structure it will be apparent that similar supporting lines A'', B'' are provided so as to effect a situation analogous to that shown in FIG. 3.

The stability of the punch 3 relative to the ring 1 is further enhanced by the fact that the ball 10 urges the shank 7 against the bottom of the bore. Since the punching forces acting on the shank 7 tend to tilt it in a plane normal to the plane of the paper (FIG. 2) the cooperation of the inner end of the shank 7 with the bottom 6 also assists in resisting such tilting.

The very specific description of the invention herein disclosed should not be taken as restrictive as it will be apparent that various modifications in design may be resorted to by those skilled in the art without departing from the scope of the following claims.

I claim:

1. In the combination that includes a base piece and an element secured thereto:

said base piece being formed with a bore opening outwardly of one face thereof,

said element including a shank adapted to be received in said bore through the open end thereof,

spring urged force means on one side of said bore urging said shank transversely of said bore toward the opposite side thereof,

said shank and bore being formed in cross section to provide two spaced points of engagement between said shank and said bore at said opposite side,

the cross sectional contour of said shank being smaller than the cross sectional contour of said bore to provide clearance therebetween whereby the periphery of said shank is engaged only by said force means and said bore at said two points to

provide stability of said element relative to said base piece,

said bore being provided with a bottom rigid with said base piece and said shank being provided with a camming surface acted upon by said spring urged force means to urge said shank against said bottom at the same time it is urged toward said opposite side,

said bore and shank being circular in cross section and said bore being enlarged at the side opposite said force means to provide a pair of junctures at said points extending axially of said bore.

2. In the combination that includes a base piece and an element secured thereto:

said base piece being formed with a bore opening outwardly of one face thereof,

said element including a shank adapted to be received in said bore through the open end thereof,

spring urged force means on one side of said bore urging said shank transversely of said bore toward the opposite side thereof,

said shank and bore being formed in cross section to provide two spaced points of engagement between said shank and said bore at said opposite side,

the cross sectional contour of said shank being smaller than the cross sectional contour of said bore to provide clearance therebetween whereby the periphery of said shank is engaged only by said force means and said bore at said two points to provide stability of said element relative to said base piece,

said bore being provided with a bottom rigid with said base piece and said shank being provided with a camming surface acted upon by said spring urged force means to urge said shank against said bottom at the same time it is urged toward said opposite side,

the radius of said bore being less than the distance from the center of the bore to another face of said base piece whereby the bore intersects said other face to provide said points of engagement.

3. In the combination that includes a base piece and an element secured thereto:

said base piece being formed with a bore opening outwardly of one face thereof,

said element including shank adapted to be received in said bore through the open end thereof,

spring urged force means having a substantially spherical camming surface on one side of said bore urging said shank transversely of said bore toward the opposite side thereof,

said shank and bore being formed in cross section to provide two spaced points of engagement between said shank and said bore at said opposite side,

the cross sectional contour of said shank being smaller than the cross sectional contour of said bore to provide clearance therebetween whereby the periphery of said shank is engaged only by said force means and said bore at said two points to provide stability of said element relative to said base piece,

said bore being provided with a bottom rigid with said base piece and said shank being provided with an angled camming surface acted upon by said

spring urged force means to urge said shank
 against said bottom at the same time it is urged
 against said opposite side,
 said camming surface being formed at such an angle
 so as to provide a component of the force of said 5
 force means urging said shank against said op-
 posite side which is greater than the component
 urging said shank against said bottom.

* * * * *

10

15

20

25

30

35

40

45

50

55

60

65