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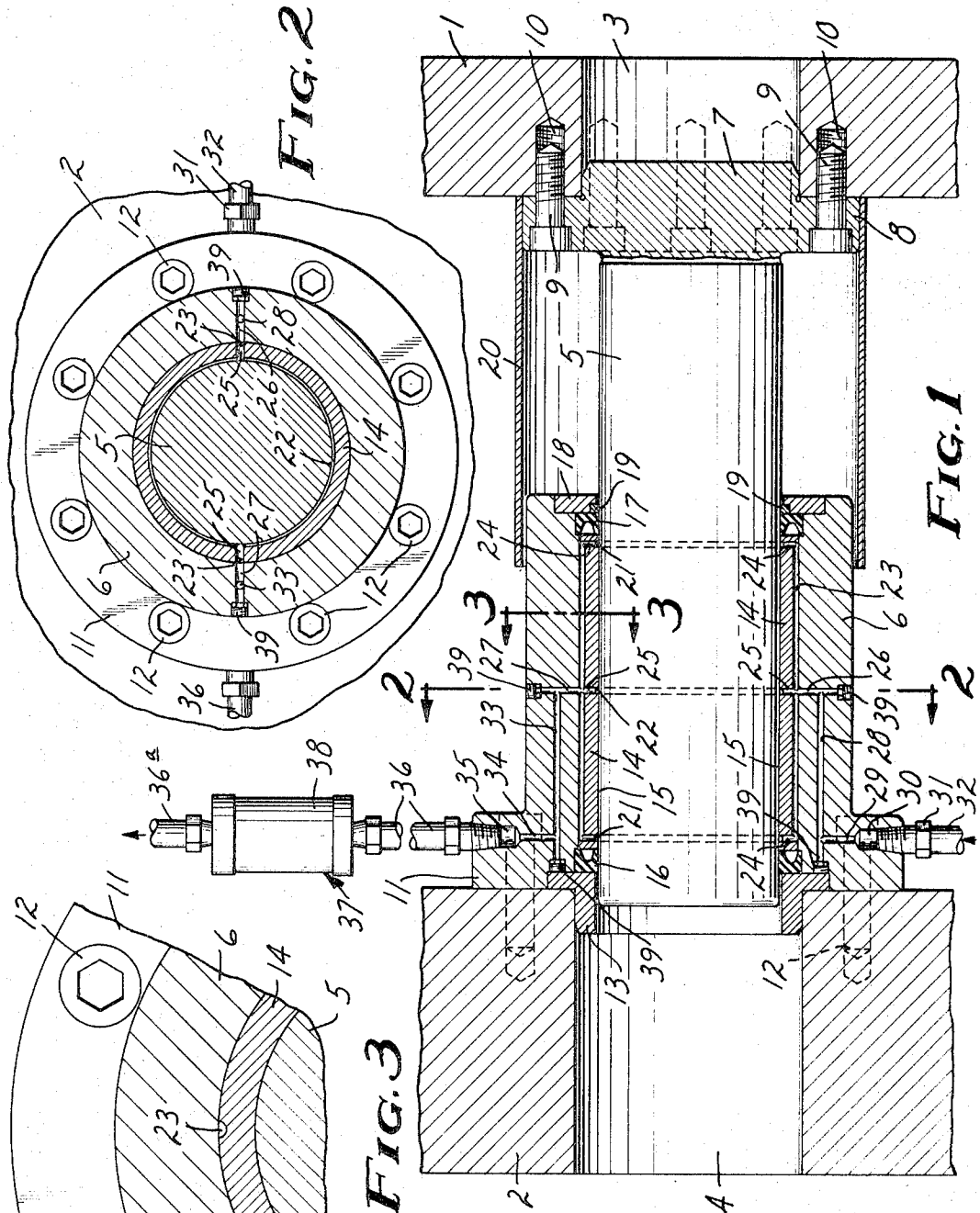


FIG. 1

FIG. 2

FIG. 3

INVENTOR.
DANIEL R. POWELL
BY Merchant & Gould
ATTORNEYS

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LEADER PIN ASSEMBLY FOR DIE SETS

Daniel R. Powell, 4111 York Ave. N.,
Minneapolis, Minn. 55422

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This invention relates generally to improvements in die sets used in the metal stamping arts, and more particularly to improved leader pin assemblies for die sets.

Leader pin assemblies generally, include pins or pillars which are secured to one of a pair of cooperating punch and die holders, and adapted to move axially through guide elements in the other of said holders. The purpose of the leader pins is to maintain accuracy of registration or alignment between cooperating punch and die elements mounted on the punch and die holders respectively, during relative movement therebetween, when mounted in a punch press or like stamping machine. Heretofore, particularly in situations wherein the die sets have been disposed in a press for generally horizontal relative movements toward and away from each other, the leader pin assemblies have been subject to undue wear and early scoring and failure due to the difficulty in providing and maintaining proper lubrication for the same.

An important object of this invention is the provision of a leader pin assembly having means for introducing and maintaining a continuous supply of lubricant to the moving parts during the operation thereof.

Another object of this invention is the provision of a leader pin assembly having sealing means to minimize loss of lubricant from the assembly. Still another object of this invention is the provision of a leader pin assembly including bearing means having a lubricant passage arrangement whereby lubricant is applied uniformly over the entire contact area between cooperating movable parts of the assembly.

Another object of this invention is the provision of a leader pin assembly which is relatively simple and inexpensive to produce, which is highly efficient in operation, and which is rugged in construction and durable in use.

The above, and still further highly important objects and advantages of this invention will become apparent from the following detailed specification, appended claims and attached drawings. Referring to the drawings, which illustrate the invention, and in which like reference characters indicate like parts through the several views:

FIG. 1 is a fragmentary view in axial section of a leader pin assembly produced in accordance with this invention;

FIG. 2 is a transverse section taken on the line 2—2 of FIG. 1, and rotated 90° with respect to FIG. 1; and

FIG. 3 is an enlarged fragmentary section taken on the line 3—3 of FIG. 1.

In the preferred embodiment of the invention illustrated, a die set is shown as comprising a commercially available punch holder 1 and a die holder 2, these being shown fragmentarily. The holders 1 and 2 are generally plate-like members adapted to have cooperating punch and die elements, not shown, mounted thereon, and to be mounted in a conventional punch press or the like, also not shown. One of the holders 1 or 2 is adapted to be secured to the bolster of the press, the other thereof being adapted to be operatively connected to the slide or ram of the press. The structure of the holders 1 and 2 is well known, and further detailed description and showing thereof is omitted, in the interest of brevity. As is usually the case with die sets, the holders 1 and 2 are provided with aligned apertures 3 and 4 respectively for mounting and reception of the usual leader pins and leader pin bushings.

The leader pin assembly of the present invention comprises a leader pin element 5 and a tubular guide element 6. At one end, the leader pin 5 is provided with a head portion 7 that is machined to accurately fit the opening 3 in the holder 1, and a circumferential flange 8 which receives a plurality of mounting screws or the like 9 that are screw threaded into threaded holes 10 in the holder 1.

The tubular guide element 6 is formed to provide a circumferential flange 11 which abuts the adjacent surface of the holder 2, the flange 11 being bored to receive a plurality of circumferentially spaced mounting screws 12 that are screw threaded into suitable threaded openings in the holder 2 to anchor the guide element 6 to the holder 2. At its flanged end, the guide element 6 is counterbored to receive a locating collar 13 which accurately aligns the tubular element 6 with the leader pin element 5.

A tubular bearing sleeve 14 is press-fitted or otherwise rigidly mounted in the guide element 6 and extends for the greater part of the length of the guide element 6, the bearing sleeve 14 preferably being made from bronze or other suitable bearing material and having an inner surface 15 that is accurately ground or otherwise finished to have a close sliding fit with the leader pin element 5. A pair of inner and outer sealing rings 16 and 17 encompass the leader pin element 5 at the opposite ends of the bearing sleeve 14 and are of conventional and well-known structure. The sealing ring 16 is interposed between the flanged collar 13 and the adjacent end of the bearing sleeve 14, the sealing ring 17 being interposed between the opposite end of the bearing sleeve 14 and a retaining ring 18 that is secured to the adjacent end of the guide element 6 by suitable means, not shown. The retaining ring 18 is formed to provide a circular recess which contains a wiper ring 19 of felt or other suitable material which prevents dust or other foreign material from being carried into the bearing sleeve 14 by the leader pin element 5 during reciprocatory movement thereof relative to the guide elements 6 and bearing sleeve 14. A generally cylindrical shield 20 is fitted at one end over the flange 8 of the leader pin element 5, the opposite end thereof loosely encompassing the tubular guide element 6, whereby to protect the exposed portion of the leader pin element 5 against particles of foreign matter, such as dust, steel shavings and the like, from coming into contact with the exposed portion of the leader pin element 5 and adhering thereto.

The inner surface 15 of the bearing sleeve 14 is circumferentially channeled to provide a pair of radially inwardly opening circumferential grooves 21 adjacent the opposite ends of the sleeve 14, and an intermediate groove 22 at the longitudinally central portion of the sleeve 14. The outer cylindrical surface of the bearing sleeve 14 is provided with a pair of diametrically opposed grooves or channels 23 that extend longitudinally for slightly less than the full length of the bearing sleeve 14. Preferably, the grooves or channels 23 are disposed at the top and bottom portions of the sleeve 14 when the leader pin assembly is axially horizontally disposed, as shown in FIG. 1. The bearing sleeve 14 is further drilled or bored to provide radial passages 24 and 25 which lead from the grooves 21 to the channels 23 and from the groove 22 to the channels 23 respectively. The guide element 6 cooperates with the grooves or channels 23 to provide oil passages communicating with the grooves 21 and 22 through the radial passages 24 and 25, and is drilled to provide radial passage portions 26 and 27 communicating with the lower and upper channels 23 respectively. An axially extending passage 28 communicates with the radial passage 26 and an inlet passage 29 which terminates in an inlet port 30 to which is applied a conventional conduit fitting 31 provided with a conduit 32 which may be assumed to be connected to a source, not shown, of liquid lubricant,

such as oil under pressure. A second axially extending passage 33 extends from the radial passage portion 27 to a radial outlet pasage 34 which terminates in an outlet port 35 to which is applied a fitting equipped conduit 36 that extends upwardly from the flange 11 of the tubular guide element 6 and to the upper end of which is mounted a flow indicator container 37 having a transparent wall 38 through which circulation of lubricant may be observed. A return line 36*a* is connected to the flow indicator container 37 and may be assumed to lead the source of lubricant supply, to complete a circulatory lubrication system. The outer ends of the passages 26, 27, 28 and 33 are closed by O-ring equipped threaded plugs or the like 39. Preferably, the pressure at which the oil is supplied to the leader pin assembly is preferably quite low, the pressure being only sufficient to maintain a proper circulation of lubricant through the various passages, grooves and channels in the guide element 6 and bearing sleeve 14.

With the above arrangement, wear on the leader pin element 5 is minimized to a point where the effective life thereof is greatly extended, and accuracy of registration between die components mounted on the holders 1 and 2 is accurately maintained over long periods of operation.

While I have shown the described a commercial embodiment of my leader pin assembly, it will be understood that the same is capable of modification without departure from the spirit and scope of the invention, as defined in the claims.

What is claimed is:

1. A leader pin assembly for the die sets comprising:
(a) a leader pin element and a cooperating tubular guide element,
(b) means for securing said elements in axial alignment each to a different one of a pair of cooperating punch and die holders,
(c) an axially extended bearing sleeve mounted in said guide element and having an inner cylindrical surface for axial sliding engagement with said pin element,
(d) said bearing sleeve having a plurality of axially spaced radially inwardly opening circumferential grooves in said inner cylindrical surface,
(e) said guide element and sleeve defining fluid passage means communicating with said grooves,
(f) said passage means including an inlet for reception of liquid lubricant under pressure and an outlet in spaced relation to said inlet,
(g) and a pair of annular sealing rings mounted in said guide element one each at an opposite end of said sleeve and snugly encompassing said pin element.

2. The leader pin assembly defined in claim 1 in which a pair of said plurality of grooves are disposed one each adjacent each end of said sleeve, and at least one of said plurality of grooves being disposed intermediate said pair of grooves.

3. The leader pin assembly defined in claim 2 in which said leader pin element and tubular guide element are axially horizontally disposed, said inlet being disposed at the lower portion of said tubular guide element, said outlet being substantially diametrically opposite said inlet.

4. The leader pin assembly defined in claim 3 in which said passage means includes a pair of diametrically opposed upper and lower axially extending passages defined by said guide element and sleeve, and radial passages in said sleeve connecting said axial passages with said grooves.

5. The leader pin assembly defined in claim 1 in which said leader pin element and tubular guide element are axially horizontally disposed, said inlet and outlet being diametrically opposed, said inlet being disposed at the bottom portion of said guide element, said passage means including a pair of diametrically opposed upper and lower axially extending passages defined by said guide element and sleeve, said circumferential groove being disposed one each adjacent an opposite end of said sleeve and one at the longitudinally central portion of said sleeve, said passage means further including axially spaced radial passages connecting said axially extending passages with said grooves and other passages connecting said inlet and outlet with said lower and upper axially extending passages respectively adjacent the radial passage to the groove at the longitudinally central portion of said sleeve.

6. The leader pin assembly defined in claim 4 in further combination with a flow indicator container connected to said outlet above the level of said tubular guide element, said container having a transparent wall portion providing a visible indication of the flow of lubricant through said passage means.

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MARTIN P. SCHWADRON, *Primary Examiner.*

ROBERT A. DUA, *Assistant Examiner.*