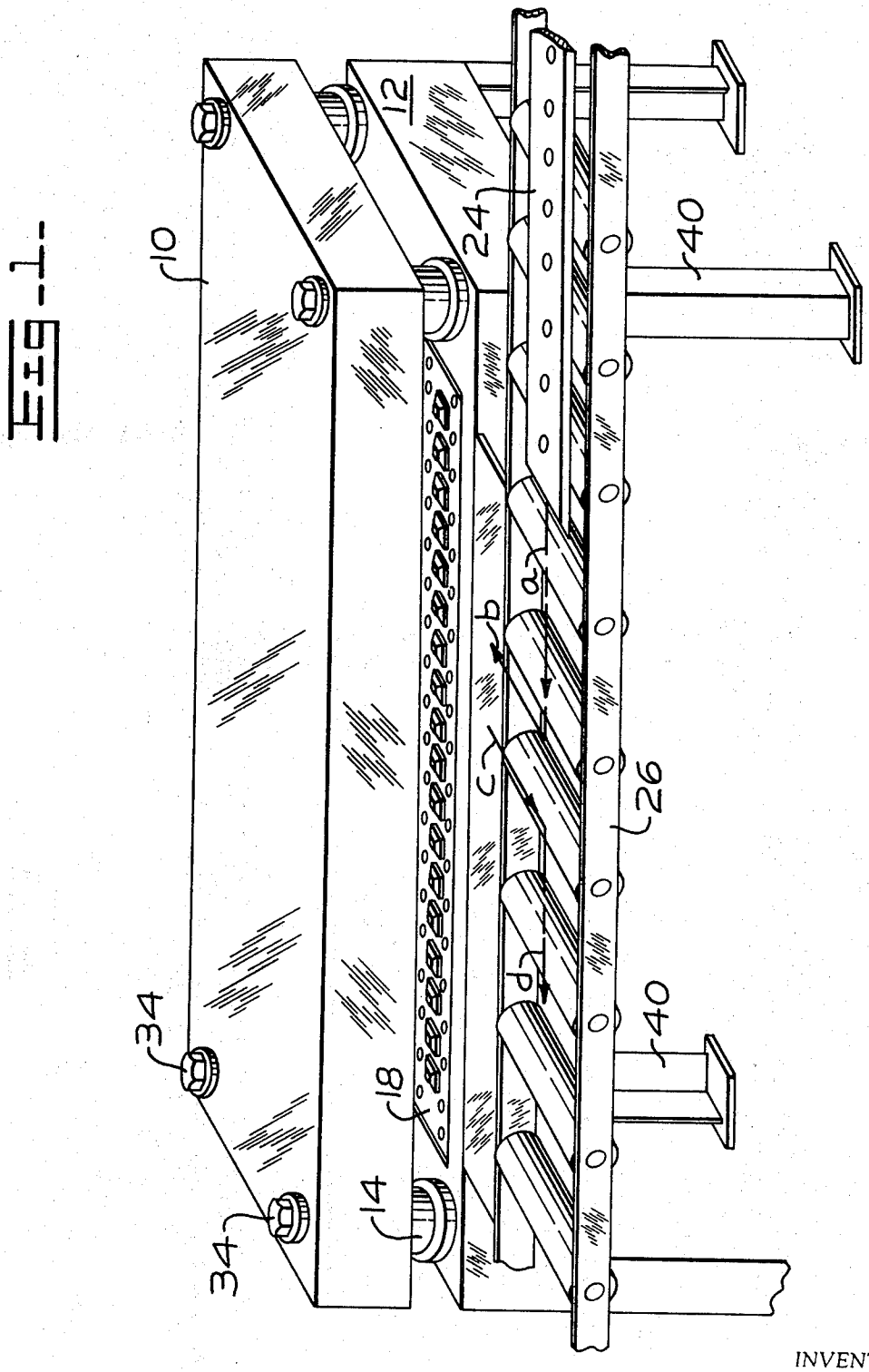
Oct. 20, 1970 W. H. LENZ 3,534,947

DIE QUENCHING APPARATUS

Filed Dec. 9, 1968 4 Sheets-Sheet 1

Fig. 1



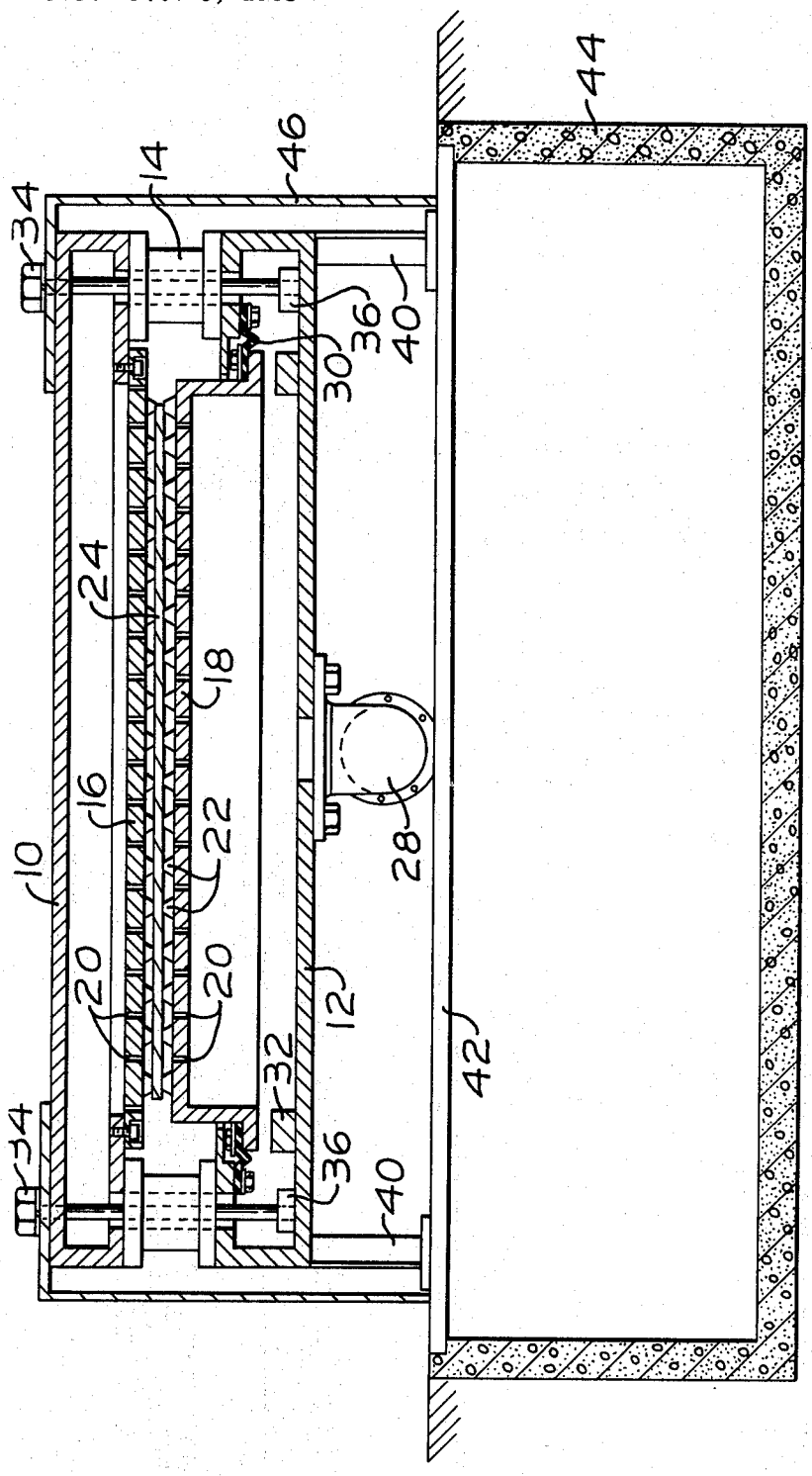
INVENTOR
WALTER H. LENZ

BY
Fryer, Tjensvold, Feix, Phillips & Lempio
ATTORNEYS

Oct. 20, 1970 W. H. LENZ 3,534,947

DIE QUENCHING APPARATUS

Filed Dec. 9, 1968 4 Sheets-Sheet 2



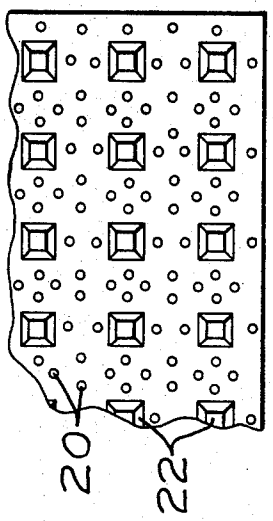


FIG-3-

FIG-2-

INVENTOR
WALTER H. LENZ

BY
Fraser, Trexler, Feix, Phillips & Lempio
ATTORNEYS

Oct. 20, 1970 W. H. LENZ 3,534,947

DIE QUENCHING APPARATUS

Filed Dec. 9, 1968 4 Sheets-Sheet 3

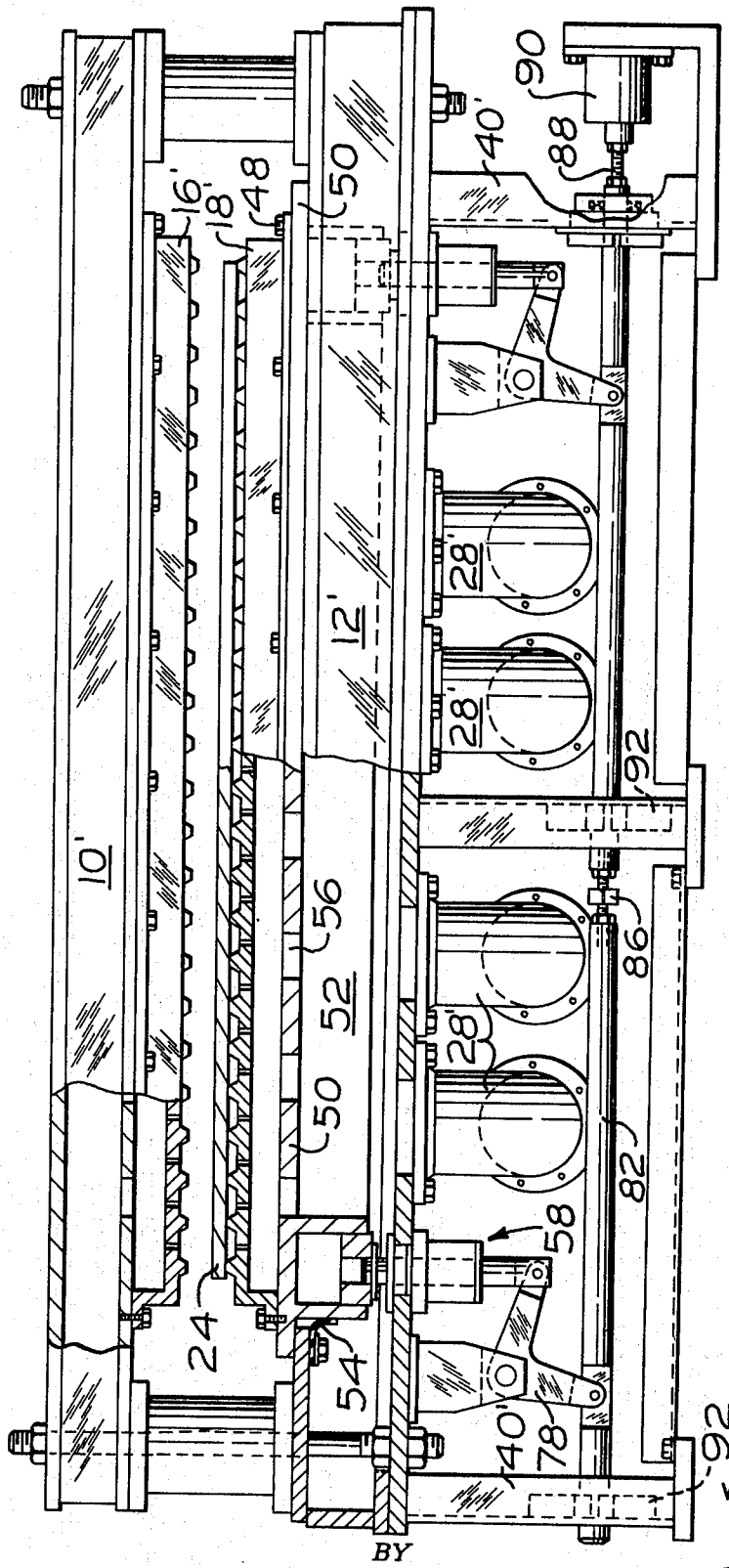


FIG-4

INVENTOR
WALTER H. LENZ

BY

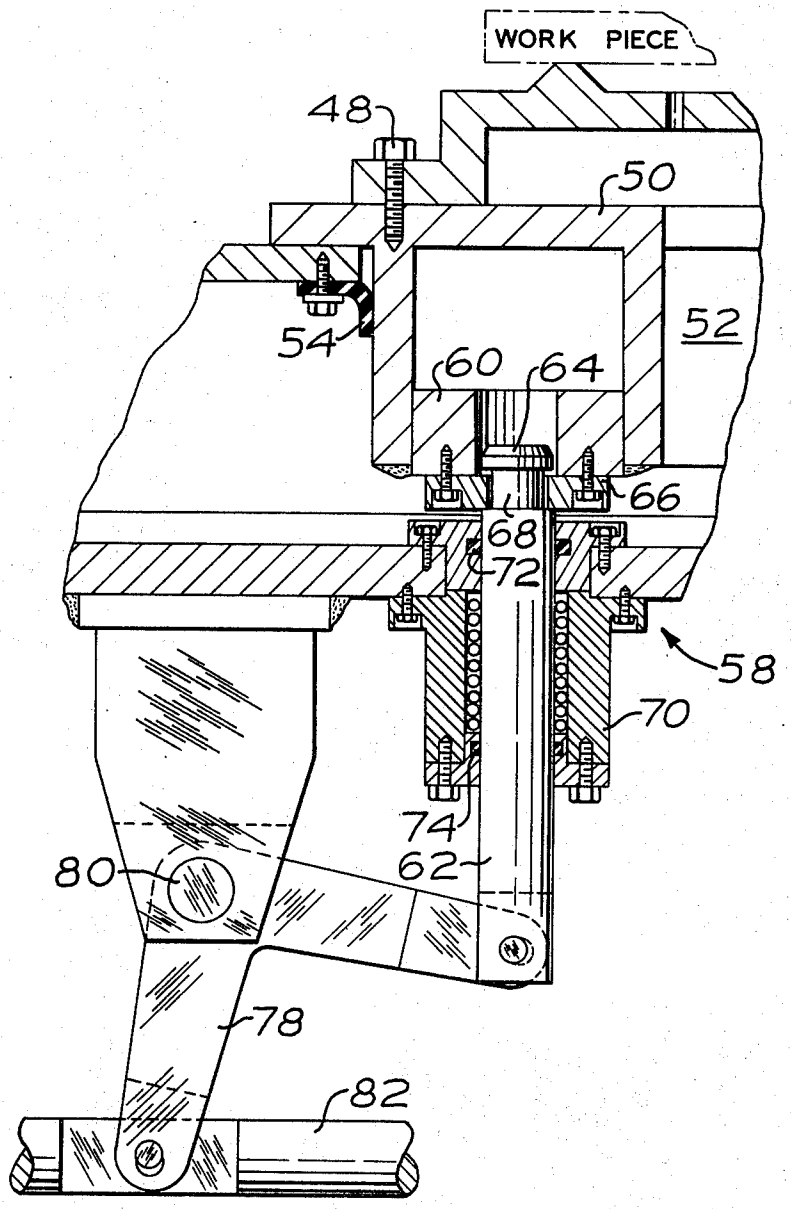
Fraser, Tjensvold, Feix, Phillips & Lempio
ATTORNEYS

Oct. 20, 1970 W. H. LENZ 3,534,947

DIE QUENCHING APPARATUS

Filed Dec. 9, 1968 4 Sheets-Sheet 4

Fig. 5.



INVENTOR
WALTER H. LENZ

BY
Fryer, Tjensvold, Feix, Phillips & Lempio
ATTORNEYS

United States Patent Office 3,534,947
Patented Oct. 20, 1970

3,534,947

DIE QUENCHING APPARATUS

Walter H. Lenz, Morton, Ill., assignor to Caterpillar Tractor Co., Peoria, Ill., a corporation of California

Filed Dec. 9, 1968, Ser. No. 782,101
Int. Cl. C21d 1/62
U.S. Cl. 266—6 8 Claims

ABSTRACT OF THE DISCLOSURE

A quenching apparatus which includes dies, at least one of which is movable toward the other to straighten, clamp and prevent distortion of a workpiece while a quenching fluid is being directed against it and in which the force for moving and clamping is derived from the pressure of the quench fluid itself.

In die-quenching, dies or vice-like parts are employed to hold a workpiece against deformation during quenching. Various means have been employed to supply the clamping force. Such means increase the cost of the apparatus and require operator attention since each part treated must be clamped and unclamped before and after quenching. The present invention provides a simple inexpensive and automatically operating means which depends entirely upon the energy of the quench fluid itself derived from a high-pressure, high-volume source.

The construction and operation of the invention will be best understood upon reading the following specification wherein it is described in detail by reference to the accompanying drawings.

In the drawings:

FIG. 1 is a perspective view of one form of die quenching apparatus which embodies the present invention;

FIG. 2 is a central longitudinal sectional view of the die-quenching apparatus of FIG. 1 shown with an enclosing shroud and as disposed over a quench pit;

FIG. 3 is an enlarged detail of a portion of one of the dies in the apparatus of FIG. 2;

FIG. 4 is a view in front elevation with parts shown in section of a modified form of the invention; and

FIG. 5 is an enlarged detail of a part of the mechanism illustrated in FIG. 4.

The die-quenching apparatus shown in FIGS. 1 and 2 includes an upper manifold **10** and a lower manifold **12** separated by hollow cylindrical spacers **14** and having dies shown at **16** and **18**. A portion of one of the dies is shown in FIG. 3 as having a plurality of perforations **20** and spaced protruding members generally referred to as buttons **22**. The plates **16** and **18** in the apparatus illustrated are generally flat and the faces of the buttons **22** on each plate are coplanar because the apparatus shown is designed for treating flat articles such, for example, as an earth-working machine cutting edge shown at **24** in FIGS. 1 and 2. In operation of the machine, as it has been thus far described, the cutting edge **24** shown in FIG. 1 is fed toward the machine on conveyor means **26** after it leaves a heating furnace, not shown, and while it is hot. It moves in the path of arrows *a* and *b* as it is fed into the machine to be quenched and after quenching follows the course of arrows *c* and *d* and moves on to a tempering furnace, not shown.

Quenching takes place after the workpiece **24** is inserted to a position between the dies **16** and **18**, the die **18** being in the lower position shown in FIG. 1. With the workpiece so positioned, a quench such as water from a high-pressure, high-volume source is introduced to the lower manifold **12** as through a pipe **28**. The quench medium performs two functions, the first of which is to supply force to raise the lower die **18** from the lower position of FIG. 1

to the uppermost position of FIG. 2 where it clamps the workpiece against the upper die **16**. The lower die is freely movable in a vertical direction through a suitable opening in the top of the manifold **12** and has a flexible diaphragm seal **30** to permit it to move between its lower position, resting on stops **32**, and its upper clamping position shown. Meanwhile, quench fluid is also passing through the hollow spacers **14** which separate the upper and lower manifolds and flooding the upper manifold **10** so the quench under high pressure emerges through all of the perforations **20** in both dies.

The manifolds are held in their proper positions by bolts **34** which extend through the manifolds and the spacers **14** and are threaded into nut-like members **36** welded to the inner bottom surface of the manifold **18**. Suitable legs **40** support the apparatus preferably on a grid represented at **42** disposed over a large pit **44** into which the quench spills as it flows out of the manifold. A shroud **46** is preferably provided around the periphery of the machine to insure that the water flows downwardly except at the forward portion which is left open to enable the workpiece to move in and out. If desired, a flexible curtain, not shown, or another temporary covering may be provided at this opening.

Thus, the clamping of the work between dies is accomplished without operator effort and automatically upon introduction of quench fluid into the apparatus.

The apparatus here illustrated is designed as mentioned above for the quenching of flat workpieces though many pieces of different configurations can be treated in this type of apparatus by simply designing the dies to conform to the shape of the workpiece as is often done in quenching devices. It is desirable for some workpieces which are not flat to have a somewhat greater range of movement of the dies. This may require better guide means for the movable die and more positive guide means are shown in FIGS. 4 and 5 wherein those parts of the quench apparatus corresponding to parts shown in FIGS. 1 and 2 have corresponding reference characters primed. In FIG. 4, the movable die is shown at **18'** as secured by cap screws **48** to a plate **50** which rests upon the edges of a suitable opening in the top of the manifold **12'**. The plate has a skirt **52** extending downwardly and spaced inwardly slightly from its marginal edge and a lip seal shown at **54** acts between the top of the manifold and the apron **52** to prevent escape of quench fluid while permitting vertical adjustment of the plate **50**. The plate is provided with large openings **56** to permit free flow of quench material therethrough. The movable die is guided for vertical movement by four guide mechanisms disposed one adjacent each corner of the die and generally indicated at **58**. This mechanism is most clearly shown in FIG. 5 wherein the plate **50** is shown as having a downwardly extending wall adjacent each end and parallel to the end portion of the apron **52**. This provides a space for a perforate block **60** which is welded in place. The upper end of a cylindrical guide pin **62** is loosely received in the block as shown at **64** and also loosely retained by a plate **66** fixed to the bottom of the block **60** by cap screws as shown. The plate **66** is formed in two parts to enable its assembly about a reduced portion **68** of the guide pin. The guide pin is vertically movable through a ball-type bushing represented at **70** of which there are several well-known makes suitable for this purpose. Seals **72** and **74** are arranged at the upper and lower ends, of the bushings to retain a lubricant in place therein. The loose fit between the upper end of the pin **62** and the member **60** in the quench chamber tends to inhibit the passage of heat from the workpiece between the dies to the pin which heat might tend to throw it out of alignment and cause binding.

The guide pins 62 are connected to each other for simultaneous movement to prevent cocking of the movable die and are also provided with cushioning or shock-absorbing means to reduce the impact when the workpiece is finally engaged upon upward movement of the die. To this end, guide pins 62 are each provided with a bell crank lever shown at 78 and the two levers at each end of the apparatus are fixed to a common shaft 80 for simultaneous movement. Also, the levers at both ends of the apparatus are connected by rods 82 to insure simultaneous movement of the four guide pins 62. The rods 82, as best shown in FIG. 4, are made in two parts connected together by a threaded adjusting member 86 and at one end the rods are connected by an adjusting member 88 which is in turn connected to a damping or a shock-absorbing device shown at 90. The purpose of this device is to damp the upward motion of the movable die as it approaches the point where the workpiece will strike the other die. The rods 82 are preferably supported in bearing members represented at 92 on the legs 40' and the connections between the levers 78 and the rods as well as with the guide pins 62 are in the form of pins and elongated slots to provide limited lost motion to accommodate the arcuate and rectilinear motions which take place.

I claim:

1. Die-quenching apparatus comprising spaced manifolds for quenching fluid, perforate dies in opposed faces of said manifolds, means supporting one of said dies for movement toward the other to effect clamping between them of a workpiece to be quenched by fluid passing from the manifolds through the perforations, and means to supply quench fluid under high pressure to said manifolds to cause the movable die to move toward the other die and clamp the workpiece during quenching.

2. The quenching apparatus of claim 1 with seal means between the movable die and the manifold in which it is disposed to permit movement and prevent escape of fluid from between the die and the manifold.

3. The quenching apparatus of claim 1 or 2 with spacers connecting the two manifolds, said spacers being hollow and forming fluid communication between the manifolds.

4. The quenching apparatus of claim 1 with guide means to prevent cocking of the movable die.

5. The quenching apparatus of claim 4 with damping means to reduce the impart of the workpiece contacting the stationary die.

6. The quenching apparatus of claim 4 in which the guide means includes a plurality of pins connected to and movable with the die, means guiding the pins for rectilinear movement, and means connecting the pins, and restraining them to equidistant movement.

7. The quenching apparatus of claim 6 in which the last means comprises a pivoted bell crank having a pivoted connection with each pin at one end, and connecting linkage between the opposite ends of all of the bell cranks.

8. The quenching apparatus of claim 7 with damping means attached to said connecting linkage to reduce the impact when a workpiece is clamped between the dies.

References Cited

UNITED STATES PATENTS

1,904,986	4/1933	Scott et al.	266—6
3,033,548	5/1962	French	266—6

GERALD A. DOST, Primary Examiner

U.S. Cl. X.R.

148—153