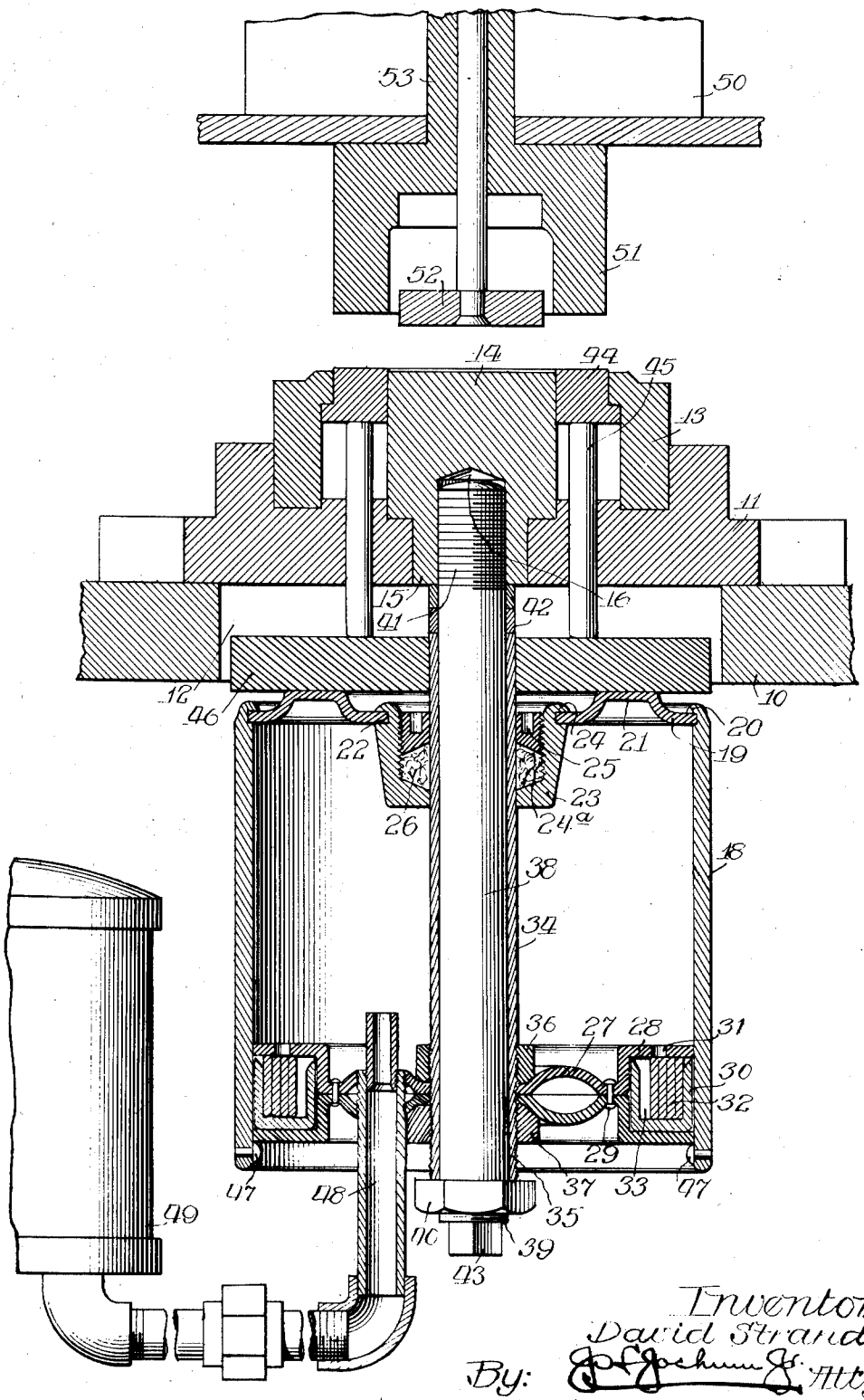
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DIE CUSHION.

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1,401,371. **Patented Dec. 27, 1921.**



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DIE-CUSHION.

1,401,371. Specification of Letters Patent. Patented Dec. 27, 1921.

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To all whom it may concern:

Be it known that I, DAVID STRAND, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Die-Cushions, of which the following is a specification.

This invention relates in general to improvements in die cushions of the fluid pressure type, but more specially the invention relates to improved means for securing the same in position by means of a single fastening device whereby the cushion may be readily applied to the machine and as readily removed therefrom.

A further object is to provide an improved device of this character, the parts of which are formed of sheet metal.

A further object is to provide an improved device of this character embodying a cylinder and piston and an improved packing for the piston.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawing illustrating this invention, and in which—

The figure is a vertical longitudinal sectional view of an improved apparatus of this character constructed in accordance with the principles of this invention and showing the same applied to a die press.

In this appliance, the machine frame or table 10 has supported thereon a bolster plate 11, having the usual centrally disposed opening 12 therethrough and supported upon the bolster plate is a cutting die 13 of any desired or suitable shape according to the shape of the work to be performed, as is usual in dies of this character. Centrally disposed within this die is a stationary center for forming block 14 of the required configuration to produce the desired pressed or drawn metal article and the reduced lower extremity 15 of this forming block projects into a suitable opening in the plate 11 and is provided with a threaded aperture 16. The die cushion consists of a cylinder 18 constructed preferably of tubing, having an end 19 also constructed of sheet material and these two parts may be secured together in any desired or suitable manner, such as by flanging one of the parts over the other as at 20 and, if desired, the end 19 may be provided with a reinforcing rib 21 formed therein. The end of the cylinder is provided with a centrally disposed opening 22 of any desired size and arranged within this opening is a packing cup or bearing member 23, which may be also secured in position by flanging a portion of one of the members over the other, as at 24. The member 23 is provided with interior threads 24^a and a packing nut 25 is arranged within the element 23 to engage the threads 24 and a suitable packing 26 is arranged between the elements. Reciprocating within the cylinder 17 is a piston which is also formed of sheet material and comprises two complementary opposed members 27 shaped to form a packing seat opening through the periphery thereof and the parts are secured together preferably by means of suitable fastening devices 29. Mounted within the packing seat 28 is an annular substantially U-shaped packing 30 of suitable fibrous material and the open end of the packing is opposed to the end of the cylinder so that one of the walls of the packing will extend across the open side of the packing seat to abut the side of the cylinder. The packing seat is provided with a plurality of openings 31 communicating with the interior of the cylinder 18, so that the fluid within the cylinder will, when the piston is reciprocated, enter the packing seat and also the packing and force the wall of the packing 30 against the cylinder wall. The packing thus formed is seated loosely in its seat so as to permit of a bodily adjustment with respect to the wall of the cylinder as well as the walls of its seat in the piston. This will permit the packing to float, so that it will be automatically adjusted by the pressure in the cylinder to compensate any irregularities of the packing. If desired, additional packing elements 32, preferably in the form of annular elements, may be arranged on edge within the packing 30 to assist in holding the same in position and against collapsing, and these elements 32 are of such a size that they will not entirely fill the packing but will form a space 33 within the packing and in which space lubricant is adapted to be held. The piston thus formed is connected to a hollow or tu-

bular piston rod 34, and which piston rod passes through a suitable aperture in the piston and is provided with suitable threads 35 adapted to be engaged by nuts 36, 37, abutting opposite faces of the piston.

The piston rod 34 passes through the packing box 23 and packing member 25 and in order to hold the cushion thus formed in position, a fastening or tie bolt 38 is provided which passes through the hollow piston rod 34. This rod or bolt is provided with threads 39 adjacent one end, upon which a suitable nut 40 is threaded so as to form a shoulder which abuts the lower end of the piston rod. The bolt 38 is of such a length that it will extend beyond the piston rod 34 and is threaded at its extremity as at 41 and which threaded extremity is adapted to be threaded into the threaded opening 16 in the forming block 14, suitable washers or filler members 42 being provided, if desired, between the end of the piston 34 and the forming block to properly position the cushion. In order to readily manipulate the bolt 38, the latter may be provided with an angular extremity 43 to which a suitable implement may be applied.

By the provision of the hollow piston rod 34, it is possible to readily attach and detach the cushion without much difficulty, and better results can be obtained in this respect because cushions of this character are generally very heavy, but only by constructing the cushion and assembling it in the manner herein shown, the weight is not only greatly reduced, but the durability is not impaired. Further, by being of a light construction, it can be easily handled.

The bolt 38 is first placed in position and securely fastened, and then the cushion is slipped onto the bolt, and by simply applying the nut 40, the device is ready for use. Furthermore, when it is desired to remove the cushion, all that is necessary is to detach the nut 40 which may be readily done. The cylinder or cushion can also be readily rotated axially to meet the conditions with regard to the pressure connections of different presses without interfering with the fastening or holding device. This may be accomplished by slightly loosening the nut 40 and then rotating the cylinder 18.

A further advantage is the fact that in the event that the threaded opening in the die 14 is not straight, or should the bolt 38 be sprung or bent, the tubular piston 34, through which the bolt passes, will permit the cushion to be placed in its proper position, owing to the fact that there is a clearance between the bolt and the tubular piston. Furthermore, with this construction it is possible to detach the cushion without dismantling the parts thereof.

Between the cutting die 13 and the forming or shaping block 14, a pressure ring 44, of suitable shape, rests upon the upper end of a plurality of rods or pins 45, adapted to slide through apertures in the plate 11, the lower ends of these rods or pins, having engagement with a plate 46 centrally apertured to receive the piston rod 34, and this plate 46 is adapted to rest upon the end of the cylinder 18, preferably upon the rib 21 so that when pressure is exerted upon the pressure ring 44, the cylinder will be depressed, the piston 27 being maintained stationary, to compress the fluid in the cylinder The lower end of the cylinder 18 is preferably open and the piston and cylinder are maintained against separation in any suitable manner, such as by means of bolts or rivets 47 arranged within the path of movement of the piston. Extending through the piston 27 is a pipe 48 associated with a compressed air tank 49 of substantial capacity, which may be supplied with compressed air from any suitable form of pumping apparatus, so that a communication will be formed between the tank and cushion, so that any increase in pressure in the cushion, due to the operation of the machine, will be rendered negligible by the fluid being allowed to flow freely back into the tank 49. Cooperating with the die is a reciprocating member 50 on which is mounted a hollow combined punch and cutting die 51. Within the cutting die 51 is a knock-out plunger 52 mounted on a stem 53.

It is thought that the operation of this improved apparatus will be clearly understood from the foregoing but briefly stated, it is as follows:

Assuming that the metal has been placed on the die 13, the member 50 and its associated parts descend, the coöperating dies 51, 13 acting to cut out a blank of the proper size and shape, the die 51 entering the die 13. As it does so, the marginal portion of the blank is gripped or clamped between the pressure ring 44 and the lower face of the punch or cutting die 51. During a continued descent of the part 51, the pressure ring 44, which is forced down by it, is pressed upwardly securely clamping the sheet metal blank by reason of the action of the compressed fluid in the cylinder 18 acting against the end 21 of the cylinder, it being understood that the fluid in such chamber is in direct communication with the interior of the tank or reservoir 49 through the pipe 48. Downward movement of the ring 44 will cause a relative movement of the cylinder 18 with respect to the piston and a portion of the fluid within the cylinder is expelled into the tank 49 by reason of such relative movement, but the capacity of the tank is such that the pressure acting upwardly on the pressure ring 44 nevertheless remains substantially constant. The pressure around

the ring, that is around the forming block, is also substantially uniform. Upon the upstroke of the part 50, the knock-out plunger 52 will recede and discharges the shaped or formed shell. Of course, as the member 50 rises, the ring 44 and its co-operating parts also rise under the action of the compressed fluid. This pressure being uniform around the ring, there is no tendency to cant the article in the discharging operation and hence, such article is stripped off the form without injury to itself.

Heretofore with piston packing rings and cup leathers as formerly used, considerable difficulty has been experienced in devices of this character to maintain a constant high pressure within the cylinder without considerable leakage, especially when air has been used as a fluid pressure means, in that it has been found necessary to anchor the packing with respect to the piston.

In the present invention, however, and with the improved annular U-shaped packing as employed by the applicant, it is possible to loosely place this U-shaped annular packing within the packing seat which opens through the periphery of the piston, allowing the packing to float therein, and find its own bearing against the cylinder wall when the air pressure is exerted upon the packing.

What is claimed as new is:—

1. A freely detachable and self-contained fluid pressure means for maintaining a substantially unvarying pressure, said pressure means embodying a cylinder and piston, and means for detachably securing the cushion in position, the last recited means embodying a tubular element connected with one of the parts of the cushion, and a tie bolt passing through the said tubular element and anchored to a fixed support whereby the other part of the cushion will have a movement relative to the anchored part.

2. A freely attachable and detachable fluid pressure die cushion embodying a cylinder and piston movable relatively one with relation to the other, and means for anchoring one of the parts against movement, the said means embodying a tubular element connected with one of the parts and a fastening bolt separate from the cushion and passing through the said element, and means on the bolt coöperating with one end of said element for supporting the cushion, the other end of the bolt detachably engaging a fixed support.

3. A freely attachable and detachable die cushion embodying a cylinder and piston, a tubular rod connected with the piston and extending beyond one end of the cylinder, a fastening bolt passing through the tubular rod, and means on the bolt adjacent one end for engaging the end of the piston rod, the other end of the bolt detachably engaging a fixed support.

4. A freely attachable and detachable die cushion embodying a cylinder and piston, a tubular rod connected with the piston and extending beyond one end of the cylinder, a fastening bolt passing through the tubular rod, means on the bolt adjacent one end for engaging the end of the piston rod, the other end of the bolt detachably engaging a fixed support, and provisions at the free end of the bolt for manipulating the latter.

5. A fluid pressure die cushion embodying a cylinder, a sheet metal end for the cylinder, said cylinder and end being secured together by flanging one part over the other, the other end of the cylinder being open, a sheet metal piston movable in the cylinder, means adjacent the open end of the cylinder for maintaining the piston within the cylinder, and means for securing said cushion in position, the last recited means embodying a tubular element connected with one of the parts, a tie bolt passing through said tubular element and detachably engaging a fixed support, and means on the bolt adapted to engage the end of the tubular element for supporting the cushion.

6. A fluid pressure die cushion embodying a cylinder and a piston movable relatively one with relation to the other, a tubular element connected with one of the parts and extending beyond the end of the cylinder, a fastening bolt passing through the tubular element, and means on the fastening bolt adapted to engage one end of the tubular element for supporting the cushion, the other end of the said bolt extending beyond the other end of the tubular element and detachably engaging a fixed support for anchoring one of the parts of the cushion.

7. A fluid pressure die cushion embodying a cylinder and a piston movable relatively one with relation to the other, a tubular element connected with one of the parts and extending beyond the end of the cylinder, a fastening bolt passing through the tubular element, means on the fastening bolt adapted to engage one end of the tubular element for supporting the cushion, the other end of the bolt extending beyond the other end of the tubular element and detachably engaging a fixed support for anchoring one of the parts of the cushion, and provisions whereby the relative movement of the cylinder and piston will cause fluid to flow into and out of the cylinder.

8. A fluid pressure die cushion embodying a cylinder and piston movable relatively one with relation to the other, the end of the cylinder being constructed of sheet material said parts being secured together by flanging one over the other, said end having an opening therein, a packing box extending into the opening and secured in position by

flanging the end of the cylinder and box one over the other, a piston rod passing through the box, packing in the box, a packing nut surrounding the piston rod, and interengaging threads on the nut and wall of the said box for compressing the packing about the piston rod.

9. A fluid pressure die cushion embodying a cylinder and piston movable relatively one with relation to the other, the end of the cylinder being constructed of sheet material said parts being secured together by flanging one over the other, said end having an opening therein, a packing box extending into the opening and secured in position by flanging the end of the cylinder and box one over the other, a piston rod passing through the box, packing in the box, a packing nut surrounding the piston rod, interengaging threads on the nut and wall of the said box for compressing the packing about the piston rod, the other end of the cylinder being open, and means adjacent said open end of the cylinder for maintaining the cylinder and piston against separation.

10. A fluid pressure die cushion embodying a cylinder and piston movable relatively one with relation to the other, the end of the cylinder being constructed of sheet material and secured to the body by flanging one over the other, said end having an opening therein, a packing box extending into the opening and secured in position by flanging the end of the cylinder and box one over the other, a piston rod passing through the box, packing in the box, a packing nut surrounding the piston rod, interengaging threads on the nut and wall of the said box for compressing the packing about the piston rod, the other end of the cylinder being open, and means adjacent said open end of the cylinder for maintaining the cylinder and piston against separation, the last recited means embodying bolts or rivets projecting laterally from the wall of the cylinder and extending into the path of movement of the piston.

11. A fluid pressure die cushion embodying a cylinder and piston movable relatively one with relation to the other, the end of the cylinder being constructed of sheet material and secured to the body by flanging one over the other, said end having an opening therein, a packing box extending into the opening and secured in position by an interengagement of the parts, a hollow piston rod passing through the box and extending beyond the end of the cylinder, packing in the box, a packing nut surrounding the piston rod and having an adjustable engagement with the box for compressing the packing therein, a fastening bolt passing through the said piston rod, and means on the bolt serving as a shoulder engaging one end of the piston rod, the other end of the bolt extending beyond the other end of the piston rod and detachably engaging a fixed support for anchoring and supporting the die cushion.

12. A freely attachable and detachable die cushion embodying a cylinder and piston, a tubular rod connected with one of the parts and extending beyond the end of the cylinder, a fastening bolt passing through the tubular rod, means on the bolt adjacent one end for engaging the end of the tubular rod, the other end of the bolt detachably engaging a fixed support, the other end of the tubular rod terminating short of the said fixed support, and one or more spacing elements interposed between the fixed support and the adjacent end of the tubular rod, and encompassing the said bolt.

13. A fluid pressure die cushion embodying a cylinder and piston movable relatively one with relation to the other, a packing box connected with one end of the cylinder and projecting into the cylinder, a piston rod passing through the box, a packing element in the box, a packing nut surrounding the piston rod, interengaging threads on the nut and wall of the said box for causing the packing to fit tightly about the piston rod, the other end of the cylinder being open, and means projecting into the path of movement of the piston for maintaining the cylinder and piston against separation.

In testimony whereof I have signed my name to this specification, on this 6th day of April, A. D. 1918.

DAVID STRAND.