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SPRING MOUNTING FOR PRESSES

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Fig. 1.

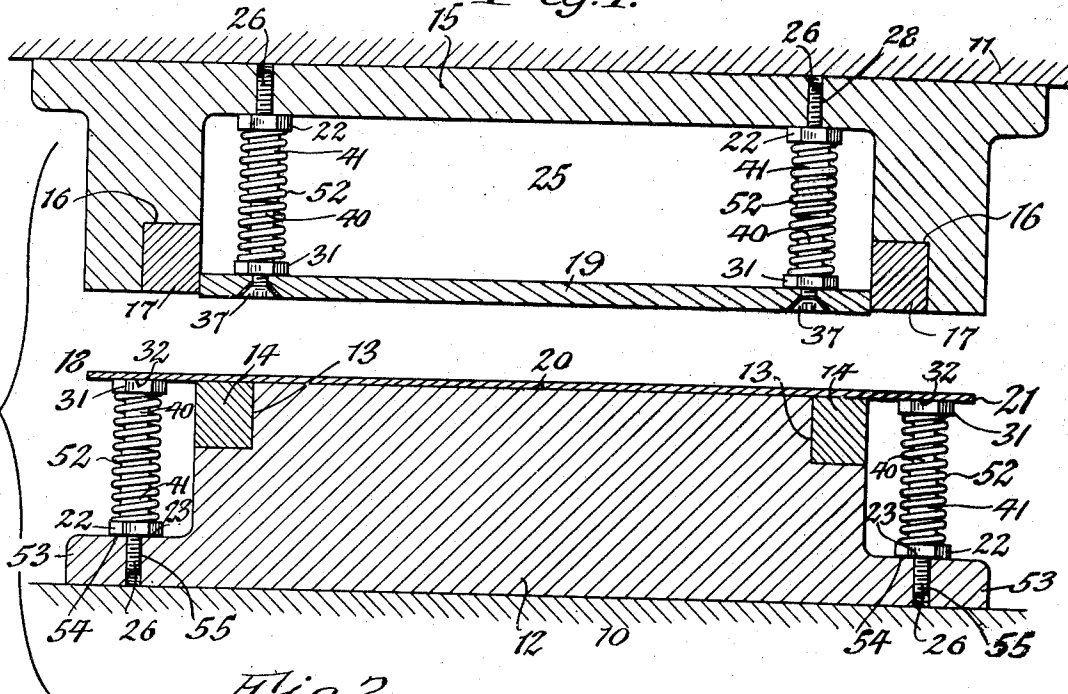


Fig. 2.

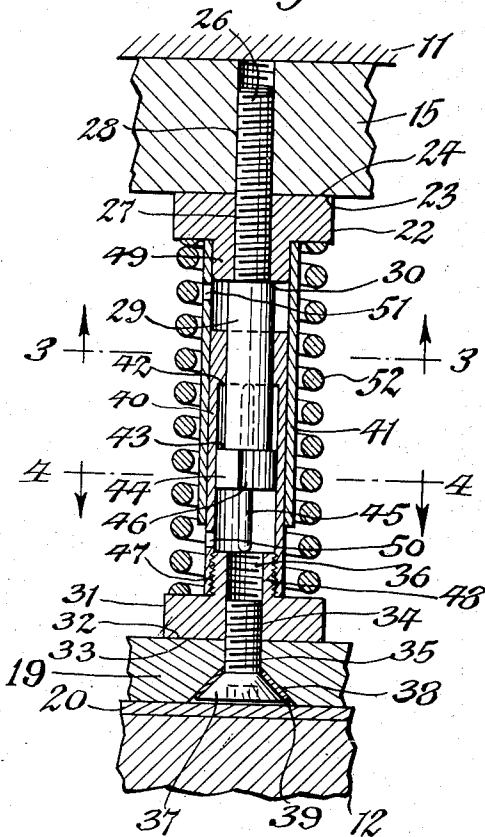


Fig. 3.

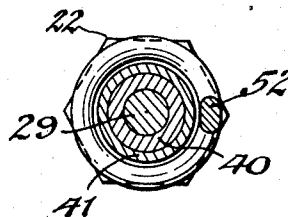
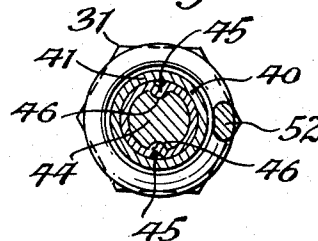


Fig. 4.



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SPRING MOUNTING FOR PRESSES

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5 Claims. (Cl. 267—1)

This invention relates to a spring mounting for use between two relatively movable members, such for example as the bed and ram of a press, and more particularly to an improvement in the spring mounting shown in Letters Patent of the United States No. 1,811,987 granted to myself June 30, 1931, for Spring mounting for presses and the like.

In the device disclosed in this patent no provision was made for retaining the end faces of the device in parallel relation to one another and because of this it has been difficult to assemble this unit with the mechanism intended to use it.

In this prior patent the threaded end of a bolt was screwed into one of the relatively movable members of the apparatus in connection with which the mounting was used until the outer or end face of a bearing disk or head was held tightly against said member and this often caused the spring means which acted on a sleeve movable lengthwise on this bolt to twist or deflect this sleeve out of axial alinement with the center line of the unit so that the bearing head or disk on said sleeve which is adapted to engage or to be connected with the other of said relatively movable members would either be cocked to one side of the center line when engaging this member or under a lateral strain when connected with this member and thus either operate imperfectly or make it difficult to attach the unit to this other member and also cause undue wear upon the bolt and sleeve as they slide one upon another. This condition was due to the limited cooperating bearing surfaces between this bolt and sleeve which surfaces were so short that the same offered little resistance to distortion effect of the spring and also made it necessary to pry the parts relatively to each other in order to enable the sleeve to be secured to the last mentioned member, thereby causing delay when installing the device of this patent.

Inasmuch as it is practically impossible to produce springs used in these devices of the same torsion it is impossible to make any two units alike and this has been found objectionable among users of the same. Moreover it is important that in devices of this character the opposite end faces of the same be maintained in parallelism and enable the parts of each unit to be guided one relative to another without causing undue wear regardless of whether the opposite ends of the unit are respectively connected to the relatively movable members or

whether only one end of said unit is connected with one of said members.

The objects of this invention are to provide a spring mounting for this purpose in which a tension or resistance of a predetermined strength may be built up and maintained under an initial load in the form of a unit which is comparatively simple in construction and capable of being easily mounted on and removed from the apparatus in which the same is used, which permits of readily changing a unit of one spring pressure to another unit of another pressure and also to repair broken springs without undue expense and loss of time.

A further object of this invention is to provide a spring mounting of this character in which the spring retaining and guiding means are so organized that the end faces of the unit are always maintained square or in parallel planes at right angles to the axis of the unit and the spring element is under an initial load when assembled and the parts are capable of operating without undue wear on the same and the parts are maintained in alinement regardless of the spring torsion.

In the accompanying drawing:

Fig. 1 is a fragmentary vertical section of a press equipped with stripping means which embody spring mountings constructed in accordance with this invention.

Fig. 2 is a vertical section, on an enlarged scale, of one of the units of the spring mounting shown in Fig. 1.

Figs. 3 and 4 are horizontal sections taken on the correspondingly numbered lines in Fig. 2.

In the following description similar reference characters indicate like parts in the several figures of the drawing:

In the particular installation of this invention shown in the drawing the same is used in connection with the stripping mechanism of a stamping or punching press commonly used for blanking, piercing, trimming, punching, forming or notching sheet metal, which press includes a stationary lower bed 10, and an upper ram 11 movable vertically toward and from the bed.

On the upper side of the bed is mounted a lower die holder 12 which is provided on its outer upper edge with a rabbet 13 in which is mounted a die 14. On the underside of the ram is mounted an upper hollow punch holder 15 which is movable vertically toward and from the die and die holder and provided at its lower inner corner with a rabbet 16 in which is seated a punch 17 which cooperates with the die for cutting or

forming into the desired shape a sheet metal work piece 18 which is placed between the die and punch and transformed thereby upon effecting an operative stroke of the punch relative to the die.

As the ram descends with a full working stroke the sheet metal workpiece or blank is severed between the cutting edges of the die and punch so as to produce an inner section 20 which is arranged within the cutting line and an outer section 21 which is arranged outside of this line.

Stripping means are provided for removing the inner and outer sections of the workpiece from the punch and die as the ram effects its upward stroke and separates the punch from the die, which stripping means embody the present improvement and are constructed as follows:

The numeral 19 represents a stripper or stripping member having preferably the form of a plate which is arranged horizontally within the hollow punch holder adjacent to the inner edge of the punch 17. This stripper plate is yieldingly mounted on the punch holder by one or more stripper units so as to permit the inner part of the workpiece upon being severed from the outer part thereof to pass upwardly into the hollow punch holder during the working stroke of the ram and to cause this inner section to be pushed downwardly out of the hollow punch holder after the stamping or cutting operation has been completed and the ram is retracted from the bed of the press.

Each of the stripper units embodies the present invention and in the form shown in Figs. 1-4 the same is constructed as follows:

The numeral 22 represents a rear bearing head which is provided with a rear bearing face 23 arranged at right angles or square to the longitudinal axis of this head and the spring stripper unit as a whole. This bearing face engages with a bearing face 24 on the bottom of the cavity 25 of the hollow punch holder which is crossed by the stripper plate 19, said holder bearing face 24 being also arranged at right angles to the axis of the respective spring stripper unit, as indicated in Figs. 1 and 2. This head may be secured to the punch holder by various means but preferably by a retaining bolt having a threaded rear shank 26 engaging correspondingly threaded openings 27, 28 in the head 22 and holder 15 and an enlarged intermediate body 29 forming a rearwardly facing shoulder 30 which engages with the inner or front end of the head 22.

The numeral 31 represents a front bearing head which is arranged axially in line with the rear bearing head and provided with a front bearing face 32 which is arranged at right angles or square to the longitudinal axis of this head and to this spring stripper unit as a whole, which bearing face engages with a bearing face 33 arranged on the upper side of the stripper plate 19 at right angles to the axis of this spring stripper unit. A connection between this front bearing head and the stripper plate may be effected in a variety of ways, but those shown in Figs. 1 and 2 are preferred and consist of a screw having a threaded shank 34 passing through an opening 35 in the stripper plate and engaging its thread with a threaded opening 36 in the bearing head and also having a screw head 37 engaging a countersunk seat 38 at the outer end of the opening 35 through the medium of an interposed lock washer 39.

The front and rear bearing heads are movable lengthwise relative to one another and guiding and retaining means are provided for maintaining the same in alinement and also limiting the extent which they can separate from one another. These guiding and retaining means preferably include a pair of telescopic guide sleeves or tubes 40, 41 the inner, overlying ends of which surround the front part of the retaining bolt while the extreme ends of these tubes are engaged respectively with the front and rear bearing heads 22, 31. The inner member 40 of these guide tubes is provided in its bore with an internal forwardly facing stop shoulder 42 which is adapted to engage with a rearwardly facing stop shoulder 43, formed by the enlarged head 44 on the front end of the retaining bolt. The body 29 of this bolt slidably engages the upper or rear part of the bore of the inner guide tube 40 and the periphery of the head 44 of this bolt engages the intermediate enlarged part of the bore of this inner guide tube, whereby this bolt and the guide tubes are reliably held in alinement and parallel with the direction of movement of the ram relative to the bed of the press while the apparatus is in operation.

The retaining bolt and inner guide tube 40 are held against relative rotation but permitted to slide lengthwise one relative to the other by means which preferably consist of a spline, key or feather 45 formed lengthwise in the bore of the inner guide tube by displacing part of the metal of the latter inwardly therefrom and providing the head 44 of the retaining bolt with a correspondingly shaped groove or keyway 46 which receives said spline or key, as shown in Figs. 2 and 4.

In the preferred construction the inner or front guide tube 40 has its front end connected by a screw and sweat joint 47 with a reduced neck 48 on the inner side of the front bearing head 31 while the rear end of the outer tube is connected by a slip and sweat joint around the periphery of a reduced neck 49 on the inner side of the rear bearing head, as shown in Fig. 2. Openings 50, 51 are formed in the guide tubes adjacent to their extremities to prevent the formation of air cushions therein which might interfere with the free expansion and contraction of the spring stripper unit while in operation and also permit internal lubrication of this unit when required.

Resilient means are provided for expanding the spring stripper unit when the working load is removed therefrom, this means consisting preferably of a helical spring 52 which surrounds the retaining bolt and guide tubes and bears with its front and rear ends against the front and rear bearing heads around the necks thereof, as shown in Fig. 2.

When assembling the parts of each spring unit the spring 52 of the same is placed under an initial load or compression so that the front and rear bearing heads of the same are separated to their greatest extent but the spring is held under an initial predetermined compression by engagement of the shoulder 43 on the retaining bolt with the shoulder 42 of the inner guide sleeve or tube 40.

While the ram is in an elevated position a gap is produced between the punch and the die and each of the spring stripper units is in its fully expanded condition and the stripper plate 19 is in its fully projected position relative to the punch and has its underside slightly below the under

side of the punch as shown in Fig. 1, or substantially so.

At this time the operator places the sheet metal blank or workpiece 18 upon the die so that the central part thereof rests on the die and the marginal part of the same projects laterally beyond the sides of the die, as shown in Fig. 1. Upon now operating the press the ram descends with a working stroke and causes the blank or workpiece to be severed by the cooperating cutting edges of the die and punch and produce a central section 20 which is received by the interior space of the punch and an outer section 21, which is depressed around the exterior of the punch in a well known manner. During this descent of the ram and punch the stripper plate 19 first engages with the upper side of the blank or workpiece and grips the same and during the continued downward movement of the punch while severing the sheet metal workpiece the stripper plate together with the front heads of the stripper units and the inner guide tubes of the same remain at rest while the rear heads, outer guide tubes and the retaining bolts of the same continue their descent with the punch to the end of the working stroke of the ram, whereby the springs of the stripper units are further compressed and placed under increased compression or load and the stop shoulder 43 of each stripper unit moves downwardly away from the companion stop shoulder 42, as shown in Fig. 2.

During the subsequent ascent of the punch the stripper plate and the front heads and inner guide tubes of the spring units remain at rest on the sheet metal workpiece until the rear heads, outer guide tubes and retaining bolts have been raised sufficiently to engage the shoulders 43 of these bolts with the shoulders 42 of the inner guide tubes after which the several parts of each spring unit ascend in unison with the punch and its supports. During the last part of the expanding action of each spring unit and just before the same rise with the punch and ram the stripper plate ejects the central or inner section of the cut workpiece from the space within the punch and leaves the same resting freely on the die.

During this contracting and expanding action of the spring units the front heads and parts connected therewith are compelled to move in a direction parallel with the line of movement of the ram and punch by means of the telescoping guide tubes which have their extremities engaged with the front and rear heads, respectively of the spring units and thereby prevent the torsion of the spring of each unit from twisting or deflecting the guiding means laterally against the retaining bolt and wearing the same unduly.

In the absence of the telescopic guiding tubes the front bearing head of the unit is usually twisted sidewise by the torsion of the stripper spring and it therefore was necessary in order to bring the front face of each spring unit square with the stripper plate and also axially in line with the respective opening in the latter to permit of applying the screw for connecting the stripper plate with the front head of the spring unit, to insert a tool through the opening in the stripper plate and into the front head of the respective spring unit and then pry this head into line with said opening preparatory to connecting this head and plate by a screw. This operation is not only expensive due to loss of time but the same also causes the spring to be strained or distorted laterally and produce an undue side pressure of the guide means against the retaining bolt

which causes the parts to wear rapidly and necessitate frequent replacement.

In the present improved construction the means for guiding the bearing heads of a spring unit relative to one another operate to maintain these heads constantly in axial alignment with each other and with their outer bearing faces square or at right angles to the longitudinal axis of the unit, thereby permitting the spring unit to be quickly and easily applied to a press and also removed therefrom when it is desired to use spring units of different strength as sometimes is required when doing different work on the press.

These means in the present improved spring unit are particularly important when the same are used in a press for direct engagement of the front bearing head with the sheet metal blank which is to be stripped from one of the punching or stamping members of the press when no stripping member, such as the stripper plate 19, is interposed between the spring stripper units and the workpiece.

An example of spring units which are not used in connection with a stripper member corresponding to the plate 19 is shown in the lower part of Fig. 1, where spring units of this character are mounted on the die holder adjacent to the outer lateral sides of the die and operate to lift or strip the outer section 21 of the blank or workpiece from the die of the press after cutting operation has been completed and the punch has been lifted from the die and workpiece. Each of the spring units mounted on the die holder is constructed exactly like those employed in connection with the punch and no separate detail description of the construction of the same is therefore necessary.

Although the die stripper units may be mounted in any suitable manner on the die holder this is preferably accomplished by engaging the threaded rear end 26 of the retaining bolt of each of these units with a threaded opening 55 in a flange 53 on the holder 12 so that this unit is arranged vertically and with its axis parallel with the direction of movement of the ram and the parts mounted thereon. When thus mounted on the die holder the rear horizontal surface 23 of the rear bearing head 22 of the respective die stripper unit engages with the horizontal upper side 54 of the respective flange 55 and when this unit is fully expanded the outer horizontal surface 32 of its front bearing head 31 is flush with the upper side of the die, or substantially so, and engages with the underside of the marginal part of the sheet metal workpiece which overhangs the respective side of the die, as shown in Fig. 1.

As the punch descends into engagement with the sheet metal blank on the die the punch severs the part resting on the spring stripper units associated with the die and its holder and depresses the front bearing heads and compresses the springs of these units, and when the punch and its holder are raised, the resilience of the springs of the die stripper units expand and cause their front bearing heads to strip or lift the cut-off part of the blank from the die.

Although Fig. 1 of the drawing shows two spring stripper units and a single stripper plate used in connection with the punch and punch holder, and two spring stripper units and no stripping member used in connection with the die and die holder it is to be understood that the number of stripper units employed may be varied and the manner of arranging and mounting

them may be varied to suit the requirements of different installations.

It will be noted that this invention provides a compressible unit in which a spring is maintained under compression by means of an internal telescopic linkage having enlarged heads at each end of substantially the same size as the outer diameter of said spring and that said heads are connected with, or are a part of telescopic tubes extending inside of said spring, and cooperate with one another in order to maintain the outer faces of said heads in parallel relation.

Moreover, one of the heads of this linkage is of hexagonal or irregular form so that a wrench or other tool can be conveniently applied thereto for gripping the same.

In this invention the bolt has an enlarged head which is slidable inside the innermost tube and has a threaded connection with the outer tube in such manner that this bolt limits the separation of said heads. Furthermore, a driving connection is employed between this bolt and the inner tube or sleeve whereby this bolt is caused to turn in either direction with the head on said tube.

I claim as my invention:

1. A spring mounting for use between two relatively movable members, comprising two relatively movable heads adapted to engage respectively with said members, two telescopic tubes engaging respectively with said heads, spring means interposed between said heads, a retaining bolt arranged within said tubes and connected with one of said heads and one of said members, and means for preventing relative rotation of the inner of said tubes and the retaining bolt but permitting relative longitudinal movement of the same consisting of a spline arranged lengthwise on the inner tube and engaging with a corresponding groove in said bolt.

2. A spring mounting for use between two relatively movable members, comprising two relatively movable heads adapted to engage respectively with said members, two telescopic tubes one of which is screwed onto one of said heads and the other tube being attached on the other head, spring means interposed between said heads, a retaining bolt arranged in said tubes and connected with one of said heads and the respective member and having a spline joint with the inner one of said tubes.

3. A spring mounting for use between two relatively movable members, comprising two relatively movable heads adapted to engage respectively with said members, two telescopic tubes one of which is screwed onto one of said heads and the

other tube being attached on the other head, spring means interposed between said heads, a retaining bolt arranged in said tubes and connected with one of said heads and the respective member and having a spline joint with the inner one of said tubes and the head connected with said inner tube being connected with the other one of said relatively movable members.

4. A compressible spring unit comprising a spring, retaining means whereby said spring is maintained under compression, including telescopic linkage tubes having enlarged heads at their outer ends of substantially the same size as the outer diameter of said spring, said telescopic tubes extending inside of said spring and cooperating with one another to maintain the outer faces of said heads in parallel relation, a bolt having an enlarged head slidable inside of the innermost of said tubes and having a threaded end screwed into the head of the outermost tube for limiting the separation of said heads, and screw means for attaching said heads to relatively movable members at each end of said unit, said screw means comprising the threaded end of said bolt extending beyond the face of said outermost tube head, and a threaded opening in said innermost tube head for the accommodation of a screw.

5. A compressible spring unit comprising a spring, retaining means whereby said spring is maintained under compression including telescopic linkage tubes having enlarged heads at their outer ends of substantially the same size as the outer diameter of said spring, said telescopic tubes extending inside of said spring and cooperating with one another to maintain the outer faces of said heads in parallel relation, a bolt having an enlarged head slidable inside of the innermost of said tubes and having a threaded end screwed into the head of the outermost tube for limiting the separation of said heads, screw means for attaching said heads to relatively movable members at each end of said unit, said screw means comprising the threaded end of said bolt extending beyond the face of said outermost tube head, and a threaded opening in said innermost tube head for the accommodation of a screw, means for turning said threaded bolt together with all elements of said unit comprising an irregular shape on the head of said innermost tube, and a driving connection between said innermost tube and bolt head to cause said bolt to turn in either direction when said shaped tube head is turned in one direction or the other.

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