United States Patent [19]

Castoe

[11] **3,814,382**

[45] **June 4, 1974**

[54] **SPRING COMPRESSOR**

[75] Inventor: **John H. Castoe,** Sunland, Calif.

[73] Assignee: **Applied Power Industries, Inc.,** Milwaukee, Wis.

[22] Filed: **Jan. 19, 1972**

[21] Appl. No.: **219,034**

[52] **U.S. Cl.** **254/10.5,** 29/227

[51] **Int. Cl.** **B23p 19/04**

[58] **Field of Search** 254/10.5; 29/215–218, 225–227

[56] **References Cited**

UNITED STATES PATENTS

1,384,472	7/1921	Leahy	29/215
2,589,042	3/1952	Brenneman	29/227
2,948,057	8/1960	Dagenais	254/10.5

Primary Examiner—Othell M. Simpson
Assistant Examiner—Robert C. Watson
Attorney, Agent, or Firm—Petherbridge, O'Neill & Lindgren

[57] **ABSTRACT**

An apparatus for compressing a spring in conjunction with a shock absorber or other similar structure wherein the apparatus includes a frame upon which a spring to be compressed is mounted. An upper yoke member is slidably mounted in the frame and is operatively connected to a power sourc whereby a bracket is in position to act with source yoke member to contact a spring being compressed. Downward movement of the yoke causes compression of the spring in a manner that any desired service or operation can be performed on the spring assembly being compressed. The frame further includes a safety mechanism to insure that the spring is safely compressed during service.

12 Claims, 9 Drawing Figures

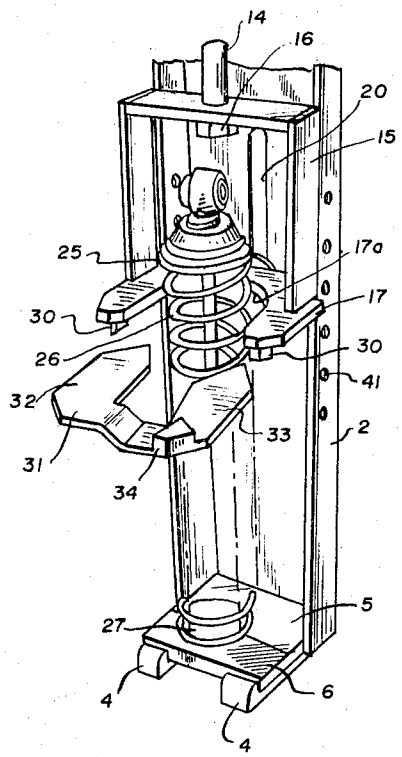


FIG. 1

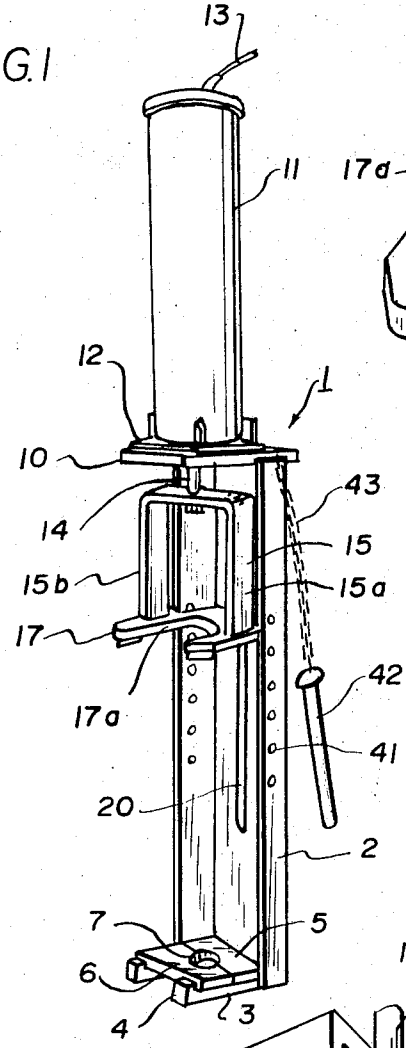
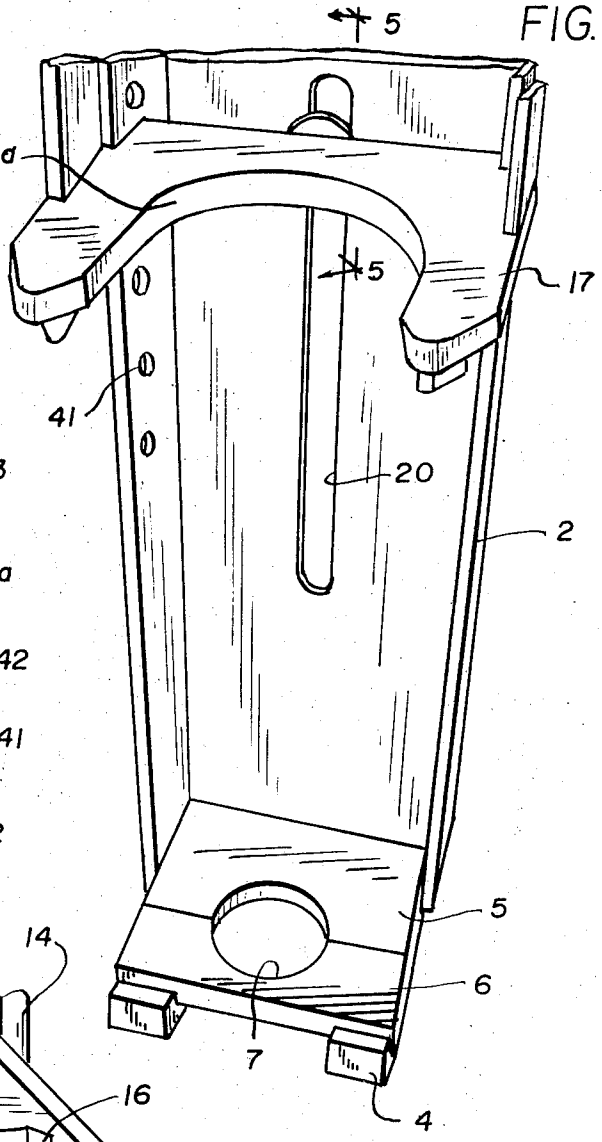


FIG. 2



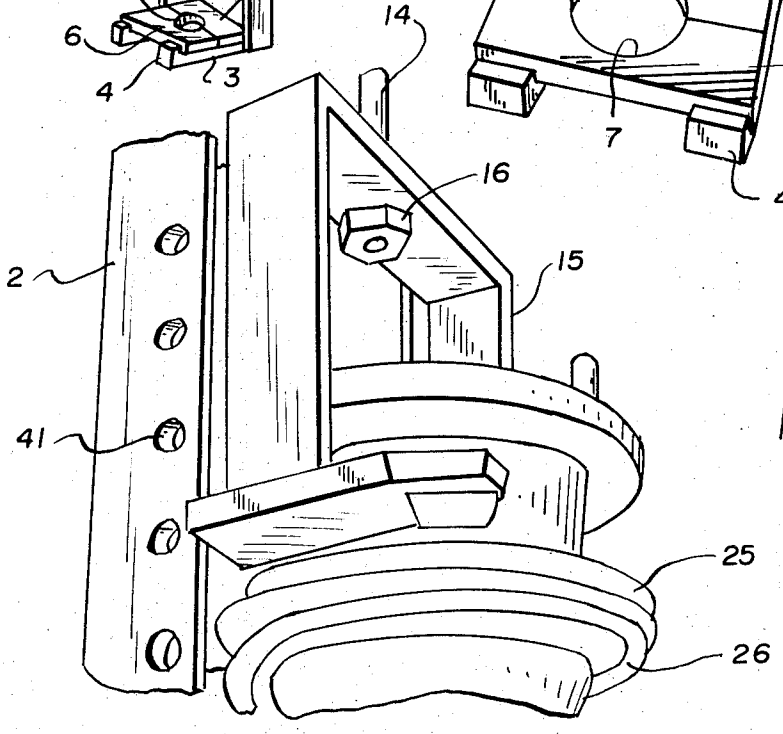


FIG. 3

FIG. 4

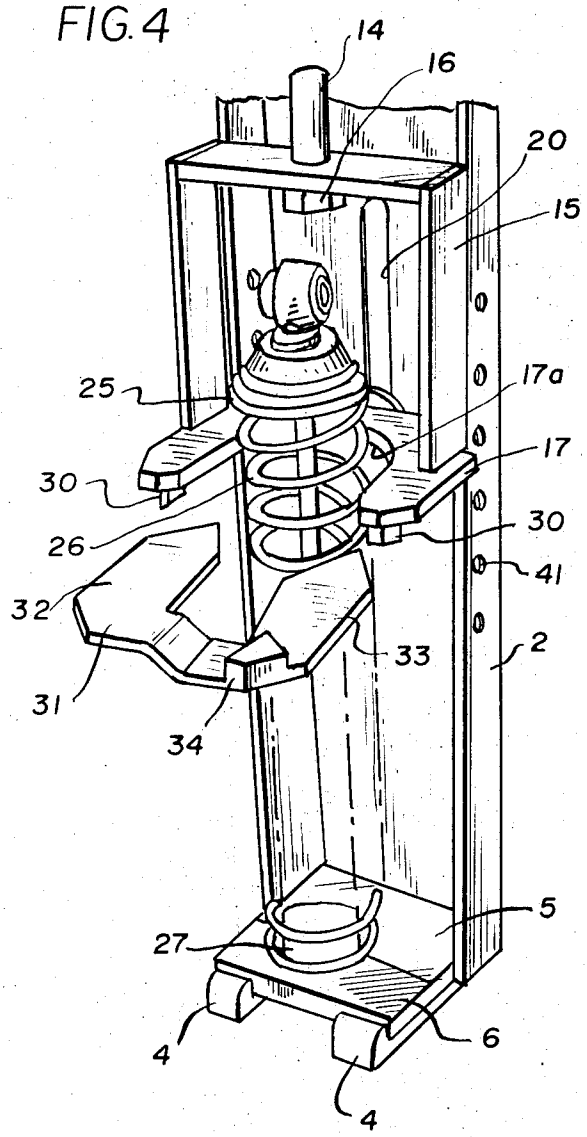

14
16
20
15
25
17a
17
30
26
30
41
32
33
2
31
34
5
27
4
6
4

FIG. 5

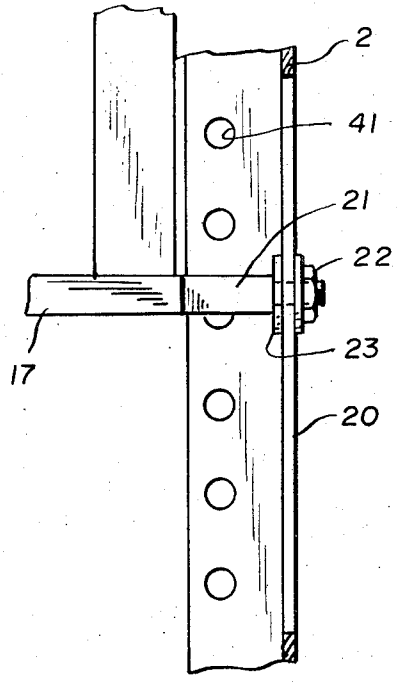

2
41
21
22
17
23
20

FIG. 6

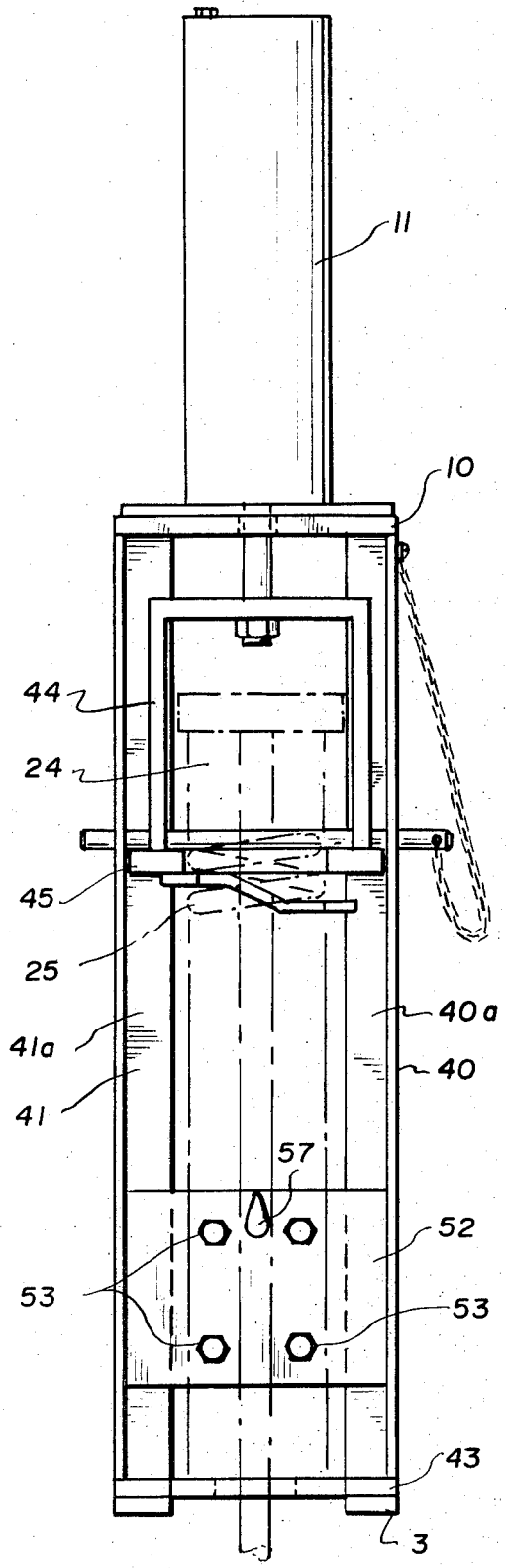

11
10
44
24
45
25
40a
41a
40
41
57
52
53
53
43
3

FIG. 7

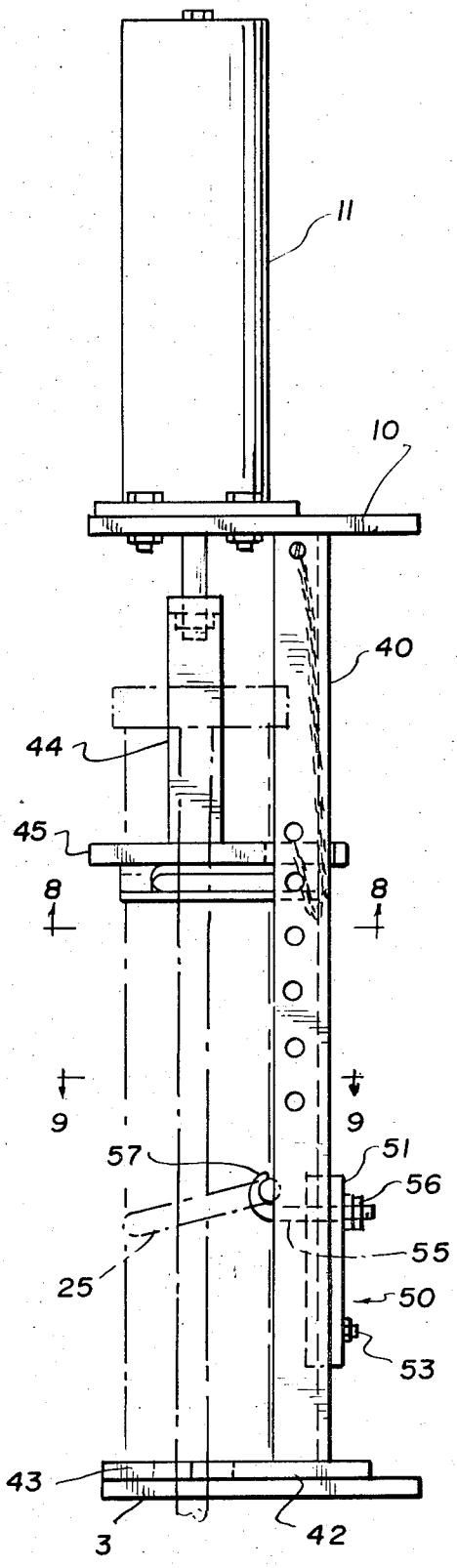

11
10
40
44
45
8
8
9
9
57
51
56
55
25
50
53
43
3
42

FIG. 8

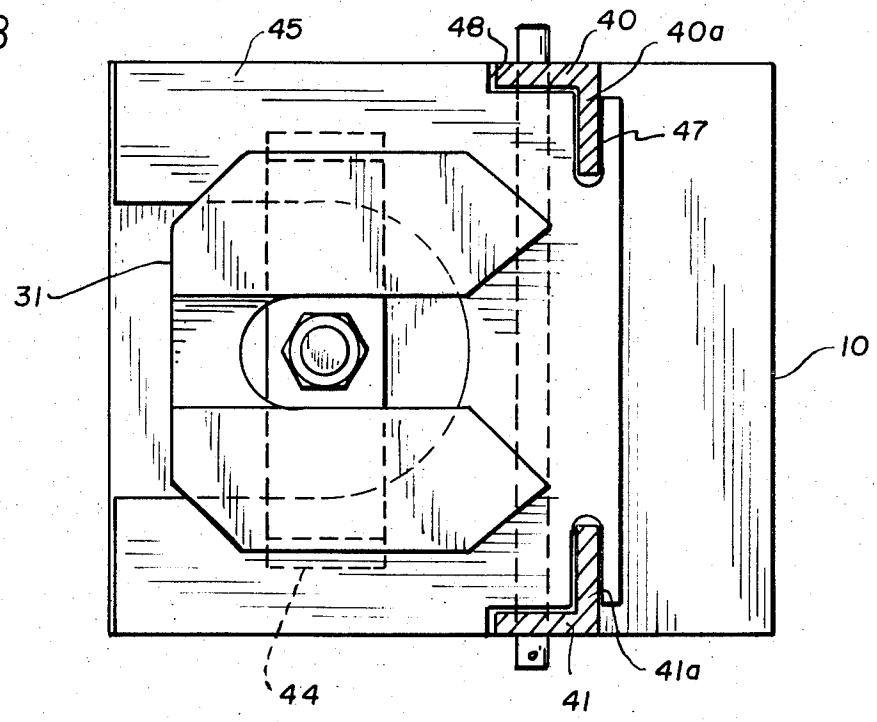
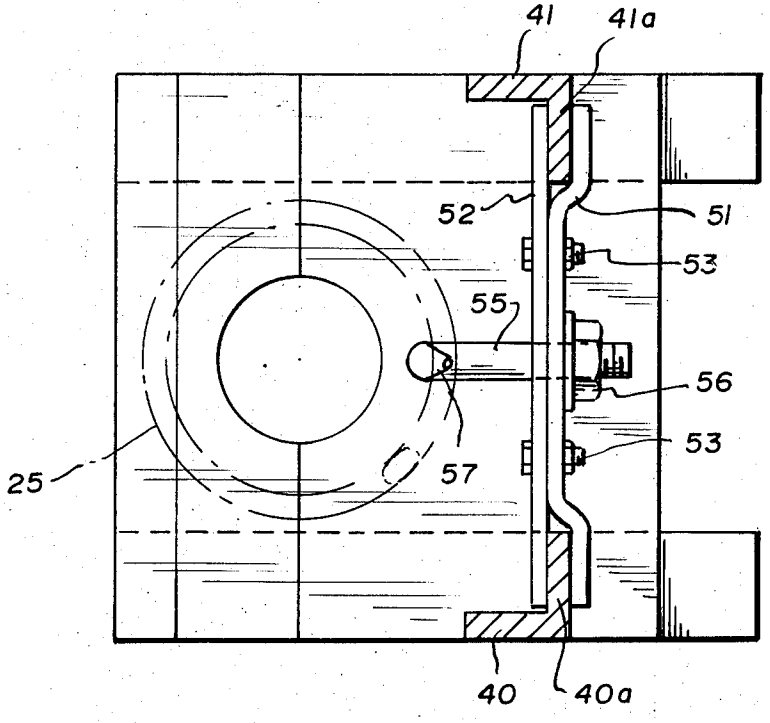


FIG. 9



SPRING COMPRESSOR

BACKGROUND OF THE INVENTION

This invention relates in general to force applying apparatus and in particular, to an apparatus for compressing a spring.

More specifically, the invention relates to a spring compressor apparatus wherein a spring assembly to be compressed is positioned on a frame and a movable force applying yoke and bracket assembly applies a downward compressive force upon a spring. The design of the invention permits the rapid operative positioning of a spring to be compressed on the device to achieve efficient compression thereof. The apparatus further includes safety features which provide protection to an operator during compression of a spring.

Although not intended to be so limited, the spring compressor apparatus is described for use in conjunction with an automotive shock absorber or suspension systems. In the service and repair of certain types of shock absorbers and suspension systems, it is necessary for a mechanic to compress the spring of the system in a manner to release the pressure or bias on bolted members which must be removed in order to repair or otherwise service the assembly. Generally, the suspension system or shock is removed from the automobile and a force is applied to the spring so that the system may be disassembled for various repairs and service.

In the prior art, a common technique of applying force to such springs in order to service a shock or suspension system has been accomplished through the use of manually actuated compressors which not only are ineffecient to use but also present certain safety hazards since the compression of a spring requires a high level of force application because of the relative strength of automotive springs. Most prior art spring compressors involve the utilization of either pivoted handle members to apply force to the spring or alternatively, the use of a threaded shaft whereby rotation of the shaft effects the desired compression of a spring. Such prior art techniques of compressing a spring to service or repair shock absorbers and suspensing systems create time consuming operations which do not permit the rapid and effecient repair that is required in modern high volume service of automobiles. Therefore, it is desirable to provide an inexpensive spring compressor apparatus which achieves rapid compression of a spring for repair and service of suspension systems and the like.

SUMMARY OF THE INVENTION

It is, therefore, an object of this invention to improve the apparatus for compressing a spring.

A further object of this invention is to minimize the time and effort necessary for compressing and servicing a spring assembly.

Another object of this invention is to improve the mounting of the spring to be compressed upon a spring compressing apparatus.

A still further object of this invention is to improve the safety of operation of a spring compressor apparatus.

Still another object of the invention is to minimize the complexity of an apparatus for effectively compressing a spring.

These and other objects are attained in accordance with the present invention wherein there is disclosed an

improved spring compressor apparatus for compressing a spring such as in shock or a suspension system of a vehicle. The improved spring compressor herein disclosed permits an operator to readily and quickly mount a spring assembly to be compressed to the frame of the apparatus and to efficiently compress the spring in a manner that repairs or other service of the assembly is easily achieved. The novel apparatus includes a frame which supports a slidably yoke member having a removable bracket to contact and apply a downward compressing force to the spring.

The yoke member includes a plate which is positioned in substantial surrounding relationship to the spring assembly so that the compressive force to the spring is applied generally through the longitudinal center of the device to reduce the possibility of the spring being unevenly compressed. A safety means is provided for use with the frame so that undesired and dangerous release of the compressed spring is not encountered. The design of the novel compressor herein disclosed also permits an operator to safely attach a spring assembly without the necessity of clamping the assembly to the apparatus. Accordingly, the invention achieves efficient compression of the springs with an apparatus which is simple in design and inexpensive to manufacture.

BRIEF DESCRIPTION OF THE DRAWINGS

Further objects of this invention, together with additional features contributing thereto and advantages accrueing therefrom, will be apparent from the following description of several embodiments of the invention when read in conjunction with the accompanying drawings, wherein:

FIG. **1** is a perspective illustration of the spring compressor apparatus of the invention;

FIG. **2** is an enlarged partial front perspective illustration of the spring compressor apparatus of FIG. **1**;

FIG. **3** is a side partial perspective illustration of the spring compressor apparatus of FIG. **1** having a spring assembly to be compressed positioned thereon;

FIG. **4** is an exploded partial front perspective view of the spring compressor apparatus of FIG. **1** having a spring assembly to be compressed positioned thereon;

FIG. **5** is a side schematic sectional illustration of the frame and bolt taken along line **5—5** of FIG. **2**.

FIG. **6** is a front schematic illustration of another embodiment of the spring compressor apparatus of the invention;

FIG. **7** is a side schematic illustration of the spring compressor apparatus of FIG. **6**;

FIG. **8** is a bottom sectional illustration of the spring compressor apparatus of FIG. **7** taken along line **8—8.**

FIG. **9** is a top sectional illustration of the spring compressor apparatus of FIG. **7** taken along line **9—9.**

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now in particular to FIGS. **1** to **5**, there is illustrated an embodiment of the novel spring compressor apparatus of the invention. Spring compressor apparatus **1** includes an elongated frame member **2** having a U-shaped configuration and being constructed of a suitably strong material such as metal and the like. Frame **2** is adapted to be vertically supported upon a support surface by means of a pair of horizontally dis-

posed legs 3 suitably attached to the bottom of frame 2 and extending from the open face of the frame. Each of the legs 3 includes an upward extending projection 4 at respective ends of the legs opposite to the frame to support a pair of base plates 5 and 6 which are adapted to contact the bottom of a spring to be compressed.

Base plate 5 may be affixed to legs 3 and frame 2 whereas base plate 5 is removable to allow the shaft or other elements of a spring assembly being serviced to be inserted into the opening or hole 7 provided through the base plates 5 and 6. To insure that the removable base plate 6 is not misplaced during use, the frame possesses a chain 8 having ends respectively affixed the frame 2 and base plate 6. The bottom of frame 2 and legs 3 are adapted to be supported on a support surface in a manner to be described in detail later.

A support plate 10 is suitably attached to the upper end of frame 2 and is adapted to support a conventional fluid power source such as a pneumatic cylinder device 11. The pneumatic cylinder device 11 includes a flat end plate 12 which contacts support plate 10 and is affixed thereto by any conventional technique. A fluid conduit 13 is coupled to a source of pneumatic pressure (not shown) to selectively apply a desired pressure force to the device. Each of the plates 10 and 12 includes a complementary hole to permit a force supplying shaft 14 coupled to pneumatic cylinder 11 to pass therethrough. A downward opening yoke member 15 is attached to a threaded end of shaft 14 by means of a nut means 16. To insure the application of a force to yoke 15 by the power source 11, the diameter of shaft 14 is greater than the diameter of the threaded end projection of the shaft passing through the yoke.

Yoke 15 includes two arms 15a and 15b which have mounted at their respective ends a horizontally disposed cut-out pusher plate 17 which includes a cut-out portion 17*a* adapted to surround a spring assembly to be compressed. Plate 17 includes a pair of slots 18 at the rear sides which permit slidable interengagement between the U-shaped frame 2 and the edge of the plate 17. The selective application of a force by pneumatic cylinder 11 achieves selective upward or downward movement of yoke 15 and plate 17 relative to frame 2. To insure the proper movement of yoke 15 and plate 17 when compressing a spring, a vertically extending slot 20 is provided on the back wall of frame 2 which extends for a length corresponding to the maximum range of movement of yoke 17 during operation of the compressor apparatus. As best shown in FIG. 5, plate 17 has a threaded shaft 21 which projects through slot 20 thereby confining the yoke to a vertical movement relative to frame 2. The shaft is maintained in operative relationship with the track of slot 20 by means of a bolt and washer arrangement 22 and 23.

Referring now to FIGS. 3 and 4, there is illustrated a spring compressor assembly in operative position on the spring compressor apparatus of the invention. The spring assembly 25 to be compressed generally encompasses any conventional automotive suspension or shock system which includes a spring 26 which must be compressed to release tension and permit the assembly to be disassembled. Further, such assemblies often include an interior shaft 27 which is adapted to be moved downward during compression of the spring. The bottom of spring 26 contacts the top base plates 5 and 6 whereby the shaft 27 is aligned with hole 7 to permit the shaft to pass therethrough. Since it is necessary to allow the shaft of many of the assemblies to move downward through hole 7 upon an application of compressive force to the spring, it is advantageous to place the spring compressor apparatus on a support surface in a manner that no obstruction is provided beneath hole 7 of the base plate.

A pair of tabs 30 project beneath the bottom surface of plate 17a of the yoke and are in contact to laterally restrain a bracket 31 which is placed incontact with a portion of the spring to be compressed. Referring in particular to FIG. 4, bracket 31 includes a substantial U-shaped configuration whereby one arm 32 is elevated with respect to a second arm 33. Such elevation of one arm of the bracket in relation to the other is provided since the bearing surfaces of arms 32 and 33 obviously must contact a portion of the helically designed spring at different elevations. The lower arm 33 of the bracket is formed with an upwardly extending end projection 34 for contacting plate 17 to insure adequate retention of the bracket.

In operation of the spring compressor apparatus of the invention, the removable base plate 6 is removed and a bottom of a conventional spring assembly 25 is placed upon the upper surface of base plate 5 whereby if a shaft is present in a spring assembly, the shaft passes through opening 7. Thereafter, base plate 6 is inserted around the shaft and beneath the spring assembly. As best shown in FIG. 4, the spring assembly extends upward through cut-out area 17a of the plate 17 and the bracket 31 is inserted beneath the plate 17 whereby arms 34 and 35 each contact tabs 30 and bottom plate 17. The bottom surface of arms 32 and 33 are then in a position to contact or nearly contact a portion of the springs since arms 32 and 33 are spaced apart a distance less than the outer diameter of the spring to be compressed. Therefore, it should be apparent that tabs 30 provide the lateral support of the bracket plate 31 and the vertical force applied to plate 17 by cylinder 11 maintains the bracket in its proper vertical position during the application of force to the spring. After the bracket is assembled into proper position adjacent the spring of bracket 17, the pneumatic actuator may be actuated to achieve the desired downward movement of yoke 17 and thus compression of the spring between the base plate and yoke plate 17. The force is applied to the spring approximately along the longitudinal center line thereof.

To insure that the spring is safely maintained in a compressed condition, a safety means is provided in the apparatus. The safety means includes a plurality of corresponding holes 41 provided in paired alignment on opposite side walls of frame 2. An elongated shaft or pin 42 is attached by chain 43 to the frame and during operation of the apparatus the pin may be selectively inserted through any pair of holes 41 in a manner that the shaft 41 is in a selected position above shaft 21 attached to plate 17. Thus, with such positioning of shaft 41 in a pair of holes, it is impossible for the yoke 15 to move upward past the safety stop provided by pin 42.

Referring now to FIGS. 6 to 9, there is illustrated a preferred embodiment of the spring compressor apparatus of the invention. The spring compressor of the embodiment of FIGS. 6 to 9 essentially operates and includes similar features illustrated as described with reference to the embodiment of FIGS. 1 to 5 with the exception that the embodiment of FIGS. 6 to 9 include

improved means for maintaining the spring in position during the downward compressive movement of pusher plate 17'. The frame of the embodiment of FIGS. 6 through 9 includes two spaced upright angle iron members 40 and 41 which include two sections which are disposed at right angles to each other wherein the members 40 and 41 include a respective inwardly disposed sections 40a and 41a.

The upper ends of the angle irons are suitably affixed to upper support plate 10 and the bottom ends of the two members are affixed to a bottom plate 42. The bottom plate is similar in design to plate 5 of FIG. 1 with the exception that the angle irons are affixed midway of the width of plate 42 to insure better balance to the apparatus. The bottom plate 42 is affixed by suitable means such by bolt means and the like (not shown) to the top surface of a pair of legs 3 which are similar in design to the legs 3 described with reference to FIG. 1.

Legs 3 of the embodiment of FIGS. 6 to 9 project a distance to the front and rear of the apparatus to insure proper stability of the compressor during the compression of the spring. A second removable base plate 43 is adapted to be placed on the top of the front legs 3 adjacent base plate 42 whereby each of the base plates have corresponding curve surfaces to form an opening 7 through the bottom of the apparatus similar as described with reference to the preceding embodiment.

As shown in FIGS. 6, 7 and 8, the yoke 15 of FIGS. 1 to 5 is replaced with a pusher yoke 44 and pusher plate 45 which is adapted to contact the spring assembly. Plate 45 includes a substantially U-shaped configuration wherein the open part of the plate embraces and surrounds the spring assembly to be compressed. Plate 45 is coupled to the angle irons 40 and 41 comprising the frame of the apparatus by means of perpendicularly disposed slots 47 and 48 formed in the back corners of the plate 45 which interengage with the respective angled sections of the angle irons to allow plate 45 to ride upward and downward in secured relationship to the frame. The bottom surface of the pusher plate 45 is flat whereby the bracket 31, similar to that disclosed with reference to FIG. 4, contacts on its upper surface the bottom of the plate during operation of the compressor. The bracket is maintained in position in contact with the spring during operation by the biasing force created between the spring and pusher plate.

A movable safety carriage 50 is mounted for sliding relationship on the respective angle iron members 40 and 41 to prevent any possibility of the spring coil being compressed from flying or being hurled from the apparatus during the compression operation. The safety carriage comprises a pair of sandwiched plates 51 and 52 wherein the back plate 51 includes a bent portion to provide a slot for slideable interengagement with the angle irons 40 and 41. The two plates are bolted together by means of four bolts 53 and at one end of the plates a central hole is provided to accommodate a safety hook member 55. The straight portion of hook 55 is threaded and receives a washer and nut member 56 to draw the hook portion 57 over the bottom of the spring. Thus the hook portion 57, in contact with the bottom of the coil, prevents the coil from being hurled outwardly in a manner to be dangerous or hazardous to the operator of the machine.

Although the invention has been described with reference to a preferred embodiment, it will be understood by those skilled in the art that various changes may be made and that the equivalents may be substituted for the elements thereof without departing from the true spirit of the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teaching of the invention without departing from its essential teachings.

What is claimed is:

1. A spring compresssor apparatus for compressing the spring of a spring assembly comprising
   - a frame means for detachably supporting a spring assembly having a spring to be compressed,
   - said frame means including a base member adapted to contact an end of the spring to be compressed,
   - force applying means slidably mounted on said frame means and adapted to apply a force adjacent the other end of the spring to be compressed;
   - said force applying means including a pusher plate having a cut-out portion adapted to receive a spring to be compressed,
   - power actuation means operatively coupled to said force applying means and adapted to apply a compressive force to the spring to be compressed, and
   - said force applying means further including a removable bracket having spaced surfaces on one face to contact spaced portions of the spring to be compressed and another surface on the opposite face to contact the pusher plate during application of a force.

2. The spring compressor apparatus of claim 1 wherein said frame means includes a vertically extending U-shaped frame adapted to vertically support the spring to be compressed.

3. The spring compressor apparatus of claim 2 wherein said force applying means is slidably mounted in a vertically disposed slot on said frame.

4. The spring compressor apparatus of claim 1 wherein the force applying means applies a compressive force in a direction along the longitudinal centerline of the spring to be compressed.

5. The spring compressor apparatus of claim 1 wherein the frame means includes a plurality of openings adapted to receive a pin member and a pin member for selective insertion in the openings to prevent movement of the force applying means past the pin.

6. The spring compressor of claim 1 further including safety means slidably mounted on the frame means beneath the force applying means and adapted to retain the spring being compressed during application of a compressive force.

7. The spring compressor of claim 1 further including projection means positioned on the pusher plate to contact the removable bracket for retaining the bracket in position in contact with the pusher plate during application of a compressive force.

8. The spring compressor of claim 1 wherein the spaced surfaces of the bracket lie in spaced planes.

9. A spring compressor apparatus for compressing the spring of a spring assembly comprising
   - a frame means for detachably supporting a spring assembly having a spring to be compressed,
   - said frame means including a base member adapted to contact an end of the spring to be compressed,
   - force applying means slidably mounted on said frame means and adapted to apply a force adjacent the other end of the spring to be compressed,

power actuation means operatively coupled to said force applying means and adapted to apply a compressive force to the spring to be compressed,

safety means slidably mounted on the frame means beneath the force applying means and adapted to retain the spring being compressed during the application of a compressive force, and

the safety means includes a hook member for hooking a portion of the spring being compressed.

10. The spring compressor of claim **9** wherein the hook member contacts a portion of the bottom of the spring being compressed.

11. The spring compressor of claim **10** wherein the frame means includes track means for slidably guiding the safety means in the direction of movement of the force applying means.

12. The spring compressor of claim **11** wherein the safety means includes a pair of sandwiched plate members for support for the hook member.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,814,382 Dated June 4, 1974

Inventor(s) John H. Castoe

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the abstract, line 6, "sourc" should read -- source --; line 7, "source" should read -- the --. Column 3, line 9, "5" should read -- 6 --. Column 4, line 9, "in contact" should read -- adapted --; line 10, "incontact" should read -- in contact --.

Signed and sealed this 1st day of October 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
U.S. GOVERNMENT PRINTING OFFICE : 869-930