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CLAMPING OR COMPRESSING APPARATUS

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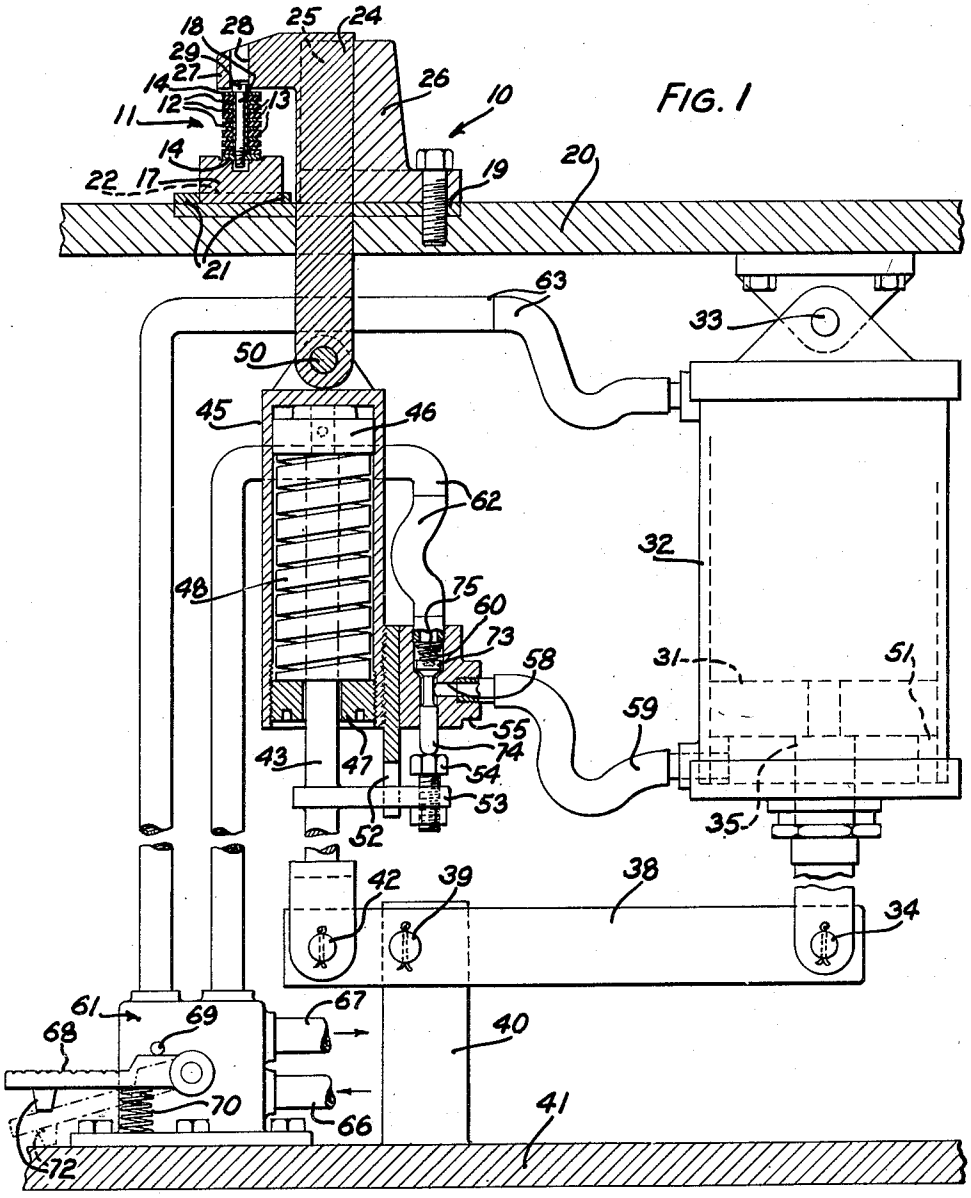

FIG. 1

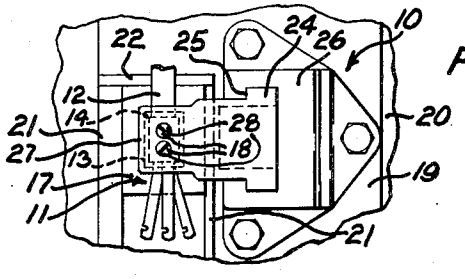

FIG. 2

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CLAMPING OR COMPRESSING APPARATUS

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3 Claims. (Cl. 121—38)

This invention relates to clamping or compressing apparatus, and particularly to a control for such apparatus whereby articles may be subjected to a predetermined uniform pressure.

Contact spring assemblies or pile-ups of relays used in telephone equipment are usually manufactured from a plurality of alternately arranged conducting contact springs and insulators with end plates clamped or compressed together uniformly. These pile-ups vary in thickness before clamping or compressing and it is difficult to clamp or compress them uniformly.

The object of this invention is to overcome this objectionable feature in clamping or compressing articles such as contact spring pile-ups and to provide a quick and efficient control mechanism for clamping or compressing apparatus which will automatically apply a predetermined uniform clamping or compressing pressure to articles of varying degrees of thickness.

In attaining this object, a pair of relatively movable clamping or compressing heads are operated by a fluid pressure piston through a predeterminedly compressed spring operating the heads. Upon the spring being further compressed in the operation of the piston a predetermined amount which will provide the desired pressure to the article, means controlled by the spring interrupts the supply of pressure fluid to the piston and no further compression of the article occurs, so that the aggregate pressure applied is determined by the spring and does not vary with the thickness of the articles.

Other objects and advantages of the invention will be understood by reference to the following specification and accompanying drawing, in which

Fig. 1 is a side view partly in section of a compressing apparatus embodying the control mechanism of this invention with a relay contact spring pile-up, shown in section, ready to be compressed, and

Fig. 2 is a fragmentary plan view of Fig. 1.

Referring to the drawing wherein one embodiment of the invention is shown applied to a bench type compressing apparatus 10 which is applicable to clamping or compressing spring contact assemblies, or pile-ups 11, of electrical relays to a predetermined amount so that all assemblies of the same kind within the capacity of the apparatus may be subjected to a similar clamping, compressing and holding pressure, irrespective of slight variations in the height of such assemblies. Such spring pile-ups generally comprise a plurality of alternately arranged conducting contact springs and insulators 12 and 13, respectively, and end plates 14. Variations in the height of this type of assemblies are due to difficulties in maintaining desired dimensional tolerances in the thicknesses of the various elements comprising the pile-ups in commercial manufacturing practice.

The spring pile-up 11 may be loosely assembled on a support 17 prior to being mounted, as shown in the drawing, on the apparatus 10 with retaining screws 18 extending through aligned apertures in the elements of the pile-up, the support being provided with depressions for receiving the projecting ends of the screws. The support 17 serves as a stationary clamping head which is moved into clamping position upon a plate 19 fixed in a stationary bench top 20, the plate having rails 21 and a stop member 22 (Fig. 2) for guiding and stopping the support in correct position relative to the apparatus 10. It is to be understood that the bench top 20 is rigidly supported in fixed relation to the floor by means not shown for the sake of simplicity.

The apparatus 10 comprises a vertically movable head 24 guided upon slideways 25 formed in a block 26 fixed to the plate 19 and bench top 20. An arm 27 extends from the movable head 24 over the support 17 and is provided with a pair of vertically extending apertures 28 dimensioned to freely receive the heads of the retaining screws 18 of the pile-up 11. The lower surface of the head arm 27 is formed with a continuous channel 29 interconnecting the apertures 28 and permitting the movement of the pile-up 11 on the support 17 into the position shown.

The head 24 is moved downwardly to compress the spring pile-up 11 a predetermined amount by the actuation of a fluid pressure operated piston 31 carried in a cylinder 32 which is pivoted at 33 to the lower surface of the bench top 20.

To interconnect the head 24 and the piston 31 and serving to control the supply of fluid pressure to the underside of the piston upon the spring pile-up 11 being subjected to the desired pressure the following mechanism is provided.

Pivoted at 34 to the lower end of a piston rod 35 attached to the piston 31 is a lever 38 fulcrumed at 39 to a vertical standard 40 integral with a base plate 41 which is fixed to the floor. A short distance from its fulcrum point 39 the lever 38 is pivoted at 42 to the lower end of a rod 43 which extends into a tubular spring housing 45, the rod having fixed to its upper end a collar 46 slidably fitted in the housing. Screw threaded

into the lower end of the housing 45 is an adjustable collar 47 through which the rod 43 is freely slidable. Within the housing 45, surrounding the rod 43 and abutting at opposite ends opposed surfaces of the collars 46 and 47 is a coiled compression spring 48, which is initially compressed a predetermined amount substantially corresponding to but slightly less than the desired pressure to which the pile-up 11 is to be subjected, by the adjustable collar 47. At its upper end the spring housing 45 is pivotally connected at 50 to the clamping head 24 which is extended at its lower end freely through an aperture in the plate 19 and bench top 20.

In the normal position of the clamping head 24, as shown, the collar 46 abuts the inner end wall of the housing 45 and the piston 31 is at the bottom of its stroke abutting an inner collar 51 on the lower head of the cylinder 32.

A forked arm 52 welded to the spring housing 45 depends below the lower end of the housing and extending through the furcations of the arm is a horizontal arm 53 fixed to the rod 43, the free end of the arm 53 carrying an adjustable screw 54, the purpose of which will be made clear presently. Fixed to the arm 52 is a valve housing 55 having an outlet port 58 connected to the cylinder 32 below the piston 31 by means of a flexible conduit 59 and an inlet port 60 connected to a manually actuated two-way control valve of any suitable conventional type, indicated in general at 61, by means of flexible and rigid conduits 62. The cylinder 32 above the piston 31 is connected to the valve 61 by means of flexible and rigid conduits 63. A suitable source (not shown) of fluid pressure is connected to the valve 61 by a conduit 66 and an exhaust conduit for the valve is indicated at 67. The control valve 61 is equipped with an actuator or foot treadle 68 for controlling the direction of the fluid pressure therefrom. In the normal position of the movable clamping head 24, as shown, the treadle 68 is held in a raised position, as shown in full lines, against a stop screw 69 by the action of a coiled compression spring 70 and the fluid pressure is being directed therefrom through the conduits 63 to the cylinder 32 above the piston 31, thus maintaining the latter in the normal position, as shown. A stop member 72 on the treadle 68 engaging the base plate 41 limits the movement of the treadle 68 to its depressed position, indicated in dotted outline.

A valve 73 in the valve housing 55 is provided with a depending stem 74 which extends through the housing and is centrally aligned with the adjustable screw 54 movable with the rod 43, which is operatively associated with the compression spring 48. In the normal position of the clamping head 24, as shown, the valve is held in a raised or open position by the previously adjusted screw 54, which is being urged upwardly by the action of the compressed spring 48. The valve 73, when the screw 54 recedes from the valve housing 55 at the completion of the compressing operation, is moved to a closed position by the energy stored in a coiled spring 75, which is held compressed in the normal position of the clamping head 24 by the screw abutting the valve stem 74.

A description of the operation of the apparatus 10 to clamp under a desired uniform pressure the same type of spring contact assemblies or pile-ups 11 irrespective of slight variations in the height of such assemblies and holding the pressure while the retaining screws 18 are tightened is as follows:

Assuming the parts are in their normal position, as described with the spring 48 under a predetermined initial compression slightly less than that to which the assembly is to be subjected, the pile-up 11 previously loosely assembled upon the support 17 is slid by an operator into position on the bench plate 19 between the guide rails 21 and against the stop member 22 and thus is correctly aligned under the arm 27 of the movable head 24 and slightly spaced therefrom, the heads of the screws 18 being centered with the apertures 28 in the head arm. The operator now depresses the foot treadle 68 and the fluid pressure is supplied to the cylinder 32 below the piston 31 through the conduits 62 past the open valve 73 and conduit 58 and the piston moves upwardly, the fluid pressure at the opposite side of the piston escaping by means of the conduits 63, valve 61 and exhaust conduit 67 to atmosphere.

The upward movement of the piston 31 through the piston rod 35 and lever 38 first moves the rod 43 carrying the collar 46 downwardly which movement is likewise transmitted to the housing 45 through the spring 48 and collar 47. As the housing moves downwardly, the clamping head 24 connected thereto also moves downwardly and the space between the arm 27 of the head and the pile-up 11 is closed up. Up to this point, in the upward movement of the piston 31, no appreciable change from the initial compression in the spring 48 has occurred. In the continued upward movement of the piston 31, the rod 43 continues to move downwardly and pull on the spring 48 and the pile-up is compressed to an amount where the resistance of the spring is overcome. The point at which the spring 48 yields, which corresponds to the desired pressure to which the pile-up 11 is to be subjected, results in the downward movement of the casing 45 being halted and in the compression thereafter of the spring 48 the screw 54 carried by the rod 43 receding from the housing 55 permits the valve stem 74 to follow under the action of the valve spring 75 and the valve 73 is moved to its closed position and the supply of fluid pressure to the underside of the piston 31 is thus automatically interrupted upon the assembly being compressed a predetermined amount, which is effected instantaneously upon depressing the treadle 68. The operator, while still holding the treadle 68 depressed, inserts a screw driver blade (not shown), which may be preferably power driven, successively into the apertures 28 of the clamping head 24 to operatively engage the heads of the retaining screws 18 and the screws are drawn tight to hold the compression on the pile-up 11.

The operator thereafter takes the pressure of his foot off the treadle 68 and it returns to its normal position, whereupon the fluid pressure is directed through the conduits 63 to the cylinder 32 and above the piston 31, which thereupon moves downwardly to its normal position. The spring 48 is thus permitted to expand, which causes the spring housing 45 and the clamping head 24 to move upwardly to the normal position thereof and likewise the screw 54 moves the valve 73 to its open position, the parts all now being in their normal position, as shown, and upon withdrawing the support 17 with the compressed pile-up 11 from under the head 24, the apparatus is ready to receive another pile-up 11 for a similar amount of compression irrespective of slight variations in the heights thereof.

From the above description of one embodiment of this invention it is apparent that a very simple

and efficient control mechanism for compressing apparatus is provided, whereby similar type articles or assemblies of elements may be subjected to a predetermined uniform pressure irrespective of slight variations in the height thereof and the pressure maintained while work is performed on the compressed article.

Although only one specific embodiment and application of the invention has been shown and described herein, it should be understood that the control mechanism is capable of other modifications and adaptations without departing from the spirit and scope of the appended claims.

What is claimed is:

1. A control mechanism for compressing apparatus having movable and stationary pressure elements comprising a source of fluid under pressure, a piston actuated by said fluid, a direct mechanical connection between the piston and movable pressure element including a tubular member connected to the movable pressure element, a shouldered member reciprocable in the tubular member, an element adjustable in the tubular member, a predeterminedly tensioned means interposed between the shouldered member and said adjustable element through which motion is applied to the movable pressure element to apply pressure a predetermined amount and thereafter to yield, and means associated with said shouldered and tubular members responsive to the yielding of said tensioned means a predetermined amount to control the movement of said piston.

2. A control mechanism for compressing apparatus having movable and stationary pressure elements comprising a source of fluid under pressure, a piston actuated by said fluid, a direct mechanical connection between the piston and movable pressure element including a tubular member connected to the movable pressure element, a shouldered member reciprocable in the tubular element, an element adjustable in the tubular member, a compression spring predeterminedly compressed between the shouldered member and said adjustable element through which motion is applied to the movable pressure element to apply pressure a predetermined amount and thereafter to yield, and constantly engaged elements carried by said shouldered and tubular members responsive to the yielding of said spring a predetermined amount to control the movement of said piston.

3. A control mechanism for compressing apparatus having movable and stationary pressure elements comprising a source of fluid under pressure, a piston actuated by said fluid, a rod connected to said piston, a direct mechanical connection between the piston rod and movable pressure element including a tubular member pivotally connected to the movable pressure element, a shouldered member reciprocable in the tubular member and extending therefrom at one end, an element adjustable longitudinally in the tubular members, a pivotally supported link pivotally connected at opposite ends to said piston rod and the extending end of said shouldered member, a predeterminedly tensioned spring interposed between the shouldered member and said adjustable element through which motion is applied to the movable pressure element to apply pressure a predetermined amount and thereafter to yield, means including a valve carried by said tubular member for supplying said fluid to the piston, and means responsive to said tensioned spring before it yields for maintaining the valve in fluid supplying position and responsive to the yielding of the spring for interrupting the supply of fluid to said piston.

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