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BALL BELL RINGER

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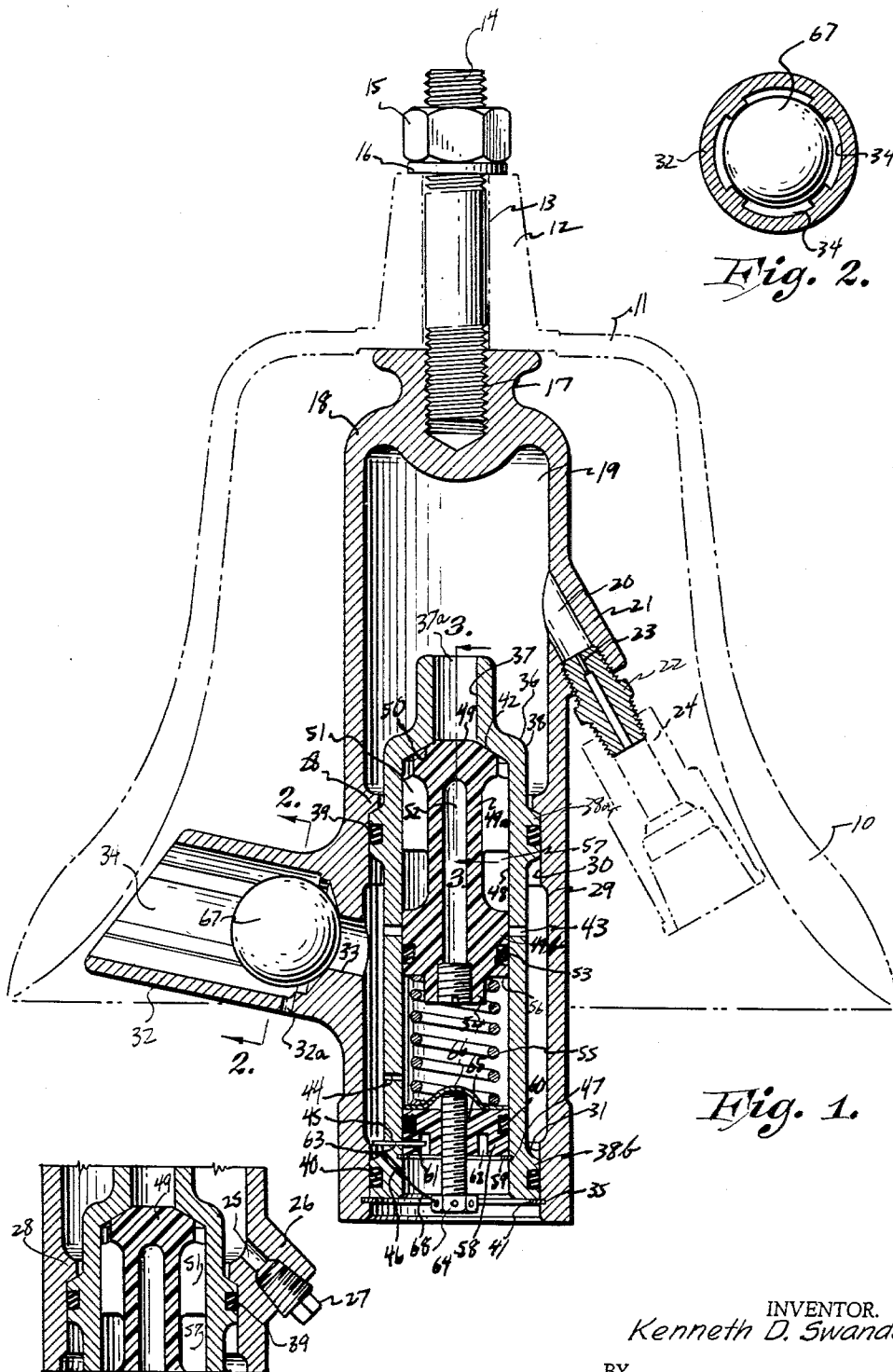


Fig. 1.

Fig. 3.

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BALL BELL RINGER

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8 Claims. (Cl. 116—151)

This invention relates to a ball type bell ringer operated by compressed air.

Objects and advantages of the invention include the provision of a spring-loaded air flow control valve mechanism which insures positive function and action at low operating pressures; the utilization of materials which permit operation free of lubrication; a total absence of mechanical linkage between the air motor or valve mechanism and the striker means whereby to eliminate problems of stall and wear of parts; the use of lightly stressed resilient means in the air motor or valve whereby to provide a positive valve cycle return action and a high cycle life; means provided operative to limit the maximum velocity of action of the cyclic air flow control valve comprising a compression chamber which prevents over-travel of the reciprocating valve portion; provision for resilient valve return means load adjustment whereby to permit selection of desired ringing frequency for a given bell thereby avoiding dampening of sounds emitted, and minimization of moisture and freezing problems due to arrangement of gravity drainage of zones where moisture may accumulate thus to keep same clear of the moving parts.

Other objects of the invention are to provide a simple, durable, efficient air actuated mechanism for locomotive bell ringing; same assuring ringing of the bell with an undampened tone under all weather conditions; the mechanism in whole and various parts speedily insertable in and removable from the bell assembly whereby to facilitate replacement of parts and maintenance.

Other and further objects of the invention will appear in the course of the following description thereof.

In the drawing, which forms a part of the instant specification and is to be read in conjunction therewith, an embodiment of the invention is shown and, in the various views, like numerals are employed to indicate like parts.

FIG. 1 is a side-sectional view of the instant ball bell ringer mechanism installed in a typical locomotive bell dome.

FIG. 2 is a view taken along the line 2—2 of FIG. 1 in the direction of the arrows.

FIG. 3 is a view taken along the line 3—3 of FIG. 1 in the direction of the arrows.

At 10 is seen the hollow, conventional cup-shaped skirt of a bell dome having cap or top 11 with bolt mounting 12 positioned centrally thereof, the latter having vertically therethrough bolt shaft receiving passage 13. Skirt 10 vibrates and gives forth a ringing sound when struck in conventional manner. Stud bolt 14 having hex nut 15 on the upper threaded end thereof with lock washer 16 therebelow extends through passage 13 and threadedly engages internally threaded opening 17 in the upper end of hollow valve body 18.

The upper hollow portion of preferably cylindrical valve body 18 comprises control reservoir 19. Side air input passage 20, having downwardly angled walls 21, has threaded thereinto pipe nipple 22 with orifice 23 therein whereby to pass compressed air in controlled quantity into control reservoir 19. Conventional hose coupling 24 is threaded onto the outside lower end of pipe nipple 21 with the lower end thereof receiving a hose (not seen) carrying compressed air to the device. Drain passage 25 (FIG. 3) is formed by downwardly angled wall 26 and threadedly receives in the outward end thereof removable pipe

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plug 27. Circumferential internal shoulder 28 extends inwardly of the lower end of control reservoir 19 immediately below drain passage 25.

The inner wall of valve body 18 is circumferentially recessed outwardly a distance below shoulder 28 as at 29 whereby to provide circumferential sealing or bearing surfaces 30 and 31 thereabove and therebelow. Body 18 has formed outwardly on one side thereof hollow cylindrical wall 32 of the ball guide with an inner passage 33 thereof communicating with the hollow interior of valve body 18 in the zone of circumferential recess 29. Longitudinal grooves 34 are provided on the inside surface of guide wall 32 for a purpose to be described. Circumferential slot 35 is provided adjacent the lower end of bearing or sealing surface 31 to receive a retaining ring to be described.

Generally cylindrical sleeve or sleeve body 36 is received within valve body 18 in the lower portion thereof below control reservoir 19. The upper end of sleeve body 36 has reduced diameter cylindrical portion 37 with passage 37a extending therethrough. The lower portion 38 of sleeve 36 is of uniform external diameter save for O-ring carrying or receiving greater diameter portions 38a and 38b thereon, same receiving O-rings 39 and 40 in circumferential grooves therewithin. Greater outer diameter portion 38a lies in sliding frictional fit against sealing or bearing surface 30 of valve body 18, while portion 38b resides in sliding frictional fit against sealing surface 31 of body 18. Retaining ring 41 fits into groove 35 and bears against the bottom surface of sleeve body 36 whereby to tightly position sleeve body 36 in valve body 18 with the upper face of extra-diameter portion 38a bearing against the downwardly inclined surface of shoulder 28. Sleeve 36 also has (1) downwardly inclined upper inner wall portion 42, (2) substantially centrally positioned ports or passages 43 communicating from the upper inside portion of the sleeve body with the space adjacent recessed valve body portion 29, (3) lower port or orifice 44, (4) pin opening 45, (5) tie-wire openings 46 and (6) circumferential groove 47. Inner wall surface portion 48 of sleeve body 36 is smooth and cylindrical in its entire height from the lower end of inclined wall portion 42 out to the open bottom of sleeve body 36.

Positioned within sleeve valve body 36 is shuttle valve body or spool 49, preferably injection molded of nylon. The upper portion of spool 49 has downwardly inclined impact faces 50 to seal against wall portion 42 of sleeve 36 with vanes 51 extending outwardly below the upper portion of body 49 90° displaced from one another circumferentially thereabout. Hollow portion 52 of spool 49 is provided to allow for shrinkage in the molding operation and has no function in the operation of the device. Vanes 51 end above the lower end of a lesser outer diameter portion 49a of body 49, portion 49a terminating in a greater outer diameter cylindrical portion 49b having a circumferential groove centrally thereof adapted to receive O-ring 53. The lower end 54 of spool 49 is of reduced diameter whereby to receive the upper end of spring 55 on shelf 56. Chamber 57 is thus provided above the upper face of greater diameter portion 49b of spool 49.

Spring retainer bushing 58 is received above retaining ring 59 in groove 47 and has therein a circumferential groove to receive sealing O-ring 60, pin receiving opening 61 and blind holes 62. Holes 62 are provided in bushing 58 so that a pin wrench may be used to rotate the bushing to properly align it so that pin 63 may be inserted in openings 45 and 61. Drilled head bolt 64, externally threaded in the shaft thereof, is received in internally threaded passage 65 in preferably nylon bushing 58 whereby the upper end thereof bears against spring retainer washer 66.

Ball 67 is received in the guide formed by ball 32. Tie-wire 68 connects openings in drilled head bolt 64 with passages 46 in sleeve body 36.

The previously described ball bell ringer mechanism fits within the bell dome or bell skirt 10 and has (and itself comprises) removable cartridge units for ease of maintenance. Thus, the innermost assembly involving spool 49 and spring retainer bushing 58 is removable by virtue of removing retainer ring 59. The assembly including the latter described subassembly and also sleeve valve body 36 is removable by removing retainer ring 41. The entire valve body 18 and all of the contained sub-assemblies is removable by unthreading stud bolt 14 or valve body 18 from same.

Signals are produced by the steel ball being flung against the bell dome skirt 10 by recurrent air blasts. The air blasts are controlled by virtue of the spring loaded shuttle valve body 49 operating in vertical reciprocation within sleeve valve body or sleeve 36.

In operation, compressed air is admitted through hose coupling 24, pipe nipple 21 and the orifice 23 therein into control reservoir 19. Within the latter, pressure is slowly built up until same overcomes the counterforce exerted on spool 49 by spring 55. This air acts through passage 38 in the top portion of sleeve body 36. When the pressure described overcomes the spring force, spool 49 moves downwardly with upper wall portion 50 moving away from its conical seat against seat portion 42 of sleeve 36. Compressed air then flows past vanes 51 and therearound in chamber 57.

The air pressure now acts on the larger diameter portion 49b of spool 49 whereby to force same to a lower position. In the latter position, circumferentially distributed ports 43 are uncovered whereby air is admitted into the zone opposite recessed portion 29 of valve body 18 and thence into passage 33 and guide 32 carrying ball 67. This air pressure flings steel ball 67 against skirt 10. The escape of air through grooves 34 and the spring load on the underside of spool 49 force spool 49 to return to its upper closed position as seen in the drawing. Ball 67 is returned by gravity to its starting position, as seen in the drawing, whereby to be ready for the next cycle. The latter starts as soon as sufficient air pressure is built up in control reservoir 19 input through orifice 23.

The spring chamber between the upper face of bushing 58 and the underside of spool 49 is sealed from the atmosphere by O-rings 53 and 60 in spool portion 49b and bushing 58, respectively. The only way for air to flow in or out of this chamber is through small vent orifice 44. The latter arrangement causes air trapped in the spring chamber to act as a pressure cushion.

Compression of spring 55 can be adjusted by turning threaded bolt 64. To make certain bolt 64 turns in bushing 58 instead of the latter turning in sleeve body 36, locking pin 63 is provided.

Pipe plug 27 can be removed to allow moisture or dirt to drain out of control reservoir 19. The space above drainage passage 25 and the top of sleeve body 36 serves as a reservoir or sump to collect such material and prevent its entry into the working portion of the device. Openings 46 in sleeve body 36 lower portion 38b which receive tie-wires 68 serve as drains for any moisture, which may accumulate between valve body 18 and sleeve body 36. In the ball guide wall 32, opening 32a drains any moisture which may accumulate in this zone.

Valve body 18 is preferably cast iron, sleeve body 36 preferably brass and spool 49 and bushings 58 preferably molded nylon. The O-rings are conventionally rubber. Other parts are preferably steel. The molded nylon has several advantages. Thus, it has a low coefficient of friction against brass and can be operated without lubrication. Also, it can be injection molded to an intricate shape and to close dimensional tolerances. A smooth surface can be produced on the molding. If metal were used for this part it would require machining. Addi-

tionally, this material is light in weight, tough and not adversely affected by changes in temperature. Furthermore, because it is elastically deformable, it makes a tight seal at the top of spool 49 in area 50 against the conical seat 42.

The cycle or cadence of the bell is determined by the working pressure, the differential areas of the inlet seat 50 and piston portion 49b on shuttle valve body 49, and the spring adjustment in conjunction with the air cushioning chamber between bushing 58 and piston portion 49b. A typical preferred adjustment of 60 to 70 cycles per minute can be obtained by presetting of the spring, which forms a semi-adjustable feature dependent upon the sound characteristics of a given bell.

The installation of this device at the highest possible location and in a position such that sound can be transmitted in the desired direction without interference is important to obtain the maximum warning signal. The inclined cylindrical bore or guide 32 should be positioned in the reverse direction to the normal direction of travel.

Thus, the spring balance shuttle valve body 49 employs both large diameter inlet and piston areas permitting low operating pressures, thus insuring positive action. Materials selected in the design permit operation free of lubrication. The absence of mechanical linkage between the shuttle valve body 49 and the ball striker 67 eliminates the problem of stall and wear on parts. The use of a lightly stressed spring 55 provides positive return action and high cycle life. The compression chamber formed between body portion 49b and the upper surface of bushing 58 in combination with orifice 44 acts to limit the maximum velocity of the shuttle valve body 49, thus preventing over-travel of same. The provision for spring load adjustment with threaded bolt 64 permits the proper selection of ringing frequency for a given bell mass to avoid dampening of sound emitted. Moisture and freezing problems are minimized due to the arrangement and provision of essentially vertical gravity drainage of zones and areas where moisture and material may accumulate, whereby to keep same away from the moving parts.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and sub-combinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. A ball type bell ringer comprising a bell dome, bell ringer mechanism substantially received within said dome, said mechanism comprising, in combination, an elongate hollow valve body axially and vertically mounted within said dome, an upwardly inclined conduit fixed to one side of said valve body in a relatively lower portion thereof, said conduit communicating with the lower interior portion of the valve body through a passage at the base of the former, a ball in said conduit adapted to roll back and forth therein and strike the lower internal skirt surface of the bell dome at the free end of the conduit, an elongate hollow sleeve body fixedly received within a relatively lower portion of the hollow valve body, said sleeve body substantially spaced below the upper end of said valve body whereby to provide a control reservoir in the valve body thereabove,

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said sleeve body circumferentially sealing against the inside surface of said valve body adjacent the upper and lower portions of the former while providing an annular space therebetween in the intermediate portion thereof, said valve body having an air inlet passage in the control reservoir portion thereof, 5
 said sleeve body having a first air flow passage there-through in the upper portion thereof whereby to pass air from the upper valve body control reservoir into the upper sleeve body interior, 10
 a second air exhausting passage therethrough in the portion thereof opposite said annular space, said sleeve body intermediate portion also opposite said conduit passage, 15
 a shuttle valve body received within said sleeve body and reciprocable vertically therein from an upper to a lower position, 20
 said shuttle valve body including a lower piston portion operative to seal off said sleeve body second passage in the shuttle body upper position and an upper closure portion operative to seal off said sleeve body first passage in the shuttle body upper position, 25
 said shuttle valve body portions unsealing said sleeve passages in the lower shuttle position, means for supplying compressed air into said valve body upper portion inlet passage above the sleeve body, and resilient means within said sleeve body normally biasing said shuttle valve body to its upper position. 30

2. A device as in claim 1 wherein the ball carrying conduit inner lower surface has at least one elongate groove therein running substantially the length thereof

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and a drain passage through the wall of the conduit communicating with said groove.

3. A device as in claim 1 including a drain opening in said valve body below the air inlet passage therein and above the upper sleeve body-valve body seal.

4. A device as in claim 1 including a drain opening in said sleeve body adjacent the lower end of the annulus and closely above the lower sleeve body-valve body seal.

5. A device as in claim 1 wherein the closure portion of said shuttle valve body sealing the first sleeve valve passage is of lesser diameter than the piston portion thereof sealing said second passage.

6. A device as in claim 1 wherein the resilient means is in said sleeve body below said shuttle valve body, the sleeve body is sealed below said resilient means and a pressure relief orifice is provided in said sleeve body closely above said seal whereby a dashpot effect is created with respect to the action of said shuttle body.

7. A device as in claim 1 including means mounted on said sleeve body lower end for adjusting the relative active force of said resilient means.

8. A device as in claim 1 wherein the sleeve body is openable downwardly and the shuttle valve body removable downwardly therefrom and the valve body is open downwardly and the sleeve body is removable downwardly therefrom.

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