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(54) Ball of clearly geometrical form, solid material composition, thrown for the percussion of bells of churches and relevant applications

(57) Ball of clearly geometrical form, solid material composition, thrown for the percussion of bells of Churches and relevant applications. The invention according to which the percussion element effecting a direct point percussion on (3a) of bell (3) is a ball (1) is innovative in:
1) in relation to known manners of direct or indirect percussion of bells in which the percussion element is, at the instant of time of percussion thereof onto (3a) of (3) (Fig. 1 and 2), mechanically linked with the overall piston operated percussion mechanism usually employed, thereby absorbing pulse sound energy and consequently altering the natural sound of the bell, contrary to the direct point percussion element that is ball (1), which at the instant of percussion is completely free from any mechanical linkage with any material body whatsoever.
2) The movement into channel and guiding route (4) of the catapult (2), that in the same time is the collector of (1) after its percussion onto (3) is carried out with slight frictions, whereby the use of friction reducing suitable ways and materials is not needed.
3) For the reintroduction of (1) at the place of departure (1a) for a new percussion, (1) does not need an energy consuming return spring.
4) The compliant response of (1) in guiding commands thereof is very good and as a result it is easy to exercise a continuous control in the intensity of percussions, as well as in their frequency per 1'' of an hour.
5) In each electromagnetic mechanism that is supplied with successively and temporally fast electric power pulses, transient phenomena of inductive fields and electromagnetic radiation are created, wherein the invention (claim 4) offers a method of reduction thereof with the creation in junction (10) of sonar vibrations of (3), an aperture (9), via which is activated the electromagnetic catapult-collector (2) of (1) following percussion of the latter onto (3a) of (3), such aperture being covered by a relatively large extent of metallic electrically inductive mass and functions as a Feed Through capacitor that excludes at a substantial extent the undesirable parasitic currents passing through the same. The electrically grounded bell (3) has the behaviour of a Faraday cage, and contributes decisively in withholding diffusion, outside its body, of inductive electric, magnetic fields and electromagnetic radiation. The two cooperatively employed reported means of withholding parasitic diffusion in the environment, i.e. aperture (9) and the Faraday cage, contribute substantially in the decision of European Union (E.M.C.) relating to the reduction of electromagnetic inductive fields and electromagnetic radiation (Electr. Magn. Conversion) the application of which will become obligatory in Greece as from 1-1-2007.

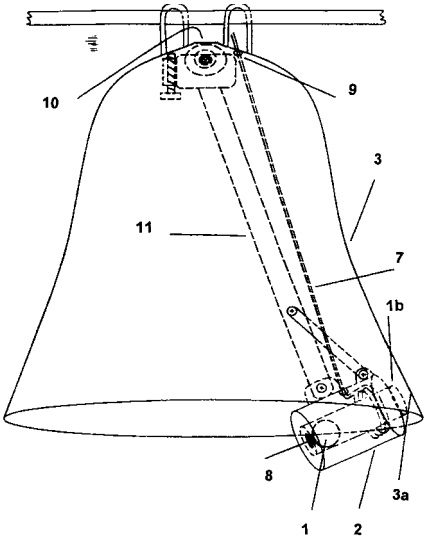

Fig. 2

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Description

[0001] The invention relates to ways and mechanisms for the percussion of basically bells of Churches, but also those of boats, factories and other spaces wherein bells are being used for the production of sound.

[0002] A piston operated bell percussion mechanism has been invented since 1967 as is being disclosed in the Greek Patent No. 35370 that amended Greek Patent No. 35262.

[0003] Nowadays, the abovementioned piston operated bell percussion mechanisms are being employed in almost all the Holy Temples of Greece, as well as in foreign countries.

[0004] Piston operated bell percussion mechanisms have disadvantages, such as the following:

[0005] Inability in changing the intensity of percussion during implementation of programmed peals.

[0006] Limited frequency of percussions, that is very difficult to exceed four percussions per 1'' of an hour in bells with a base diameter larger than 0.75m.

[0007] Frictions in the sliding piston that directly or indirectly strikes the bell thereby rendering the necessity of use of lubricant substances with sealing washers or even ball bearings, this resulting in the increase of the cost of materials and of labour for the assembly of the mechanism, as well as increased cost for its maintenance thereafter.

[0008] The employment of a return spring adapted to facilitate return in the initial starting position of the electromagnetically moving piston for the percussion of the bell.

[0009] The piston in all phases of operation thereof maintains a continuous mechanical linkage with the entire piston operated percussion mechanism, thereby resulting to the overall piston operated percussion mechanism with its fixing basement constituting a single solid mass, during percussion of the bell, that absorbs pulse sound energy.

[0010] This alters the colour of the sound of the bell in comparison to that achieved by the person skilled in the art of bell ringing and moreover it creates flumps.

[0011] The phenomena related to "flumps" become audible since they are transmitted even within the solid structure of the bell-tower and of course always during percussion.

Clarifying comment

[0012] With an extension into the purely sonar phenomena of the sounds of the bell being rung, we arrive at the cognitive result that because of the mechanic linkage of the piston operated percussion mechanism with the bell and especially during percussion thereof, the natural parameters of a certain number of harmonics are altered, thereby effecting changes in the colour (tone) and in certain cases because of the "mask" phenomenon in the intensity of the sound produced thereby also.

[0013] The advantages of this invention lie in that the described disadvantages and of course the disadvantages that do exist in relation to the piston operated bell percussion mechanisms are radically eliminated, with the "Ball of clearly geometrical form, of solid material composition, thrown for the percussion of bells of Churches and relevant applications".

[0014] At the instant of percussion of the bell by the ball, the latter is not mechanically linked with the catapult means of the same, but is practically absolutely free, merely with the gravitational field acting thereupon, that is eventually used as a beneficial supply of energy when following percussion the ball returns to the position of rest that in the same time also is the position of departure for the repetition of a new percussion.

[0015] No return spring is needed. No lubricant is needed for the reduction of friction. It has a capacity of more than 15 percussions per 1'' of an hour. The colour of the sound of the bell at percussion is not altered, because at the instant that percussion takes place the ball is not mechanically linked with the catapult thereof. Increasing or decreasing the intensity of percussion during a programmed peal is very easy. Fig. 1 presents an example of an embodiment of the invention and the mode of operation thereof with an electromagnetic catapult 2 that also becomes the collector means for the ball 1 following percussion thereof at point 3a of the bell 3. Immediately after the percussion, the ball 1 returns at the entry of channel 4 and is collected by catapult 2. The catapult 2 is suspended at the junction 10 by means of a metallic suspension member 11 (Fig. 2).

[0016] The invention uses in the example selectively and not restrictively an electromagnetic mode for supplying ball 1 with kinetic energy so that it may acquire an impulse J=m.u for the same to be thrown at bell 3 and ring it. With the same electromagnet 5 is further also achieved a controlled speed of return of ball 1 at the point of departure 1a for the repetition of a new percussion. Still with a suitable regulation of the magnetic flux within space 6, it is possible that ball 1 receives not only propulsion energy along the longitudinal axis of the guiding channel 4, but also an attraction exerted by a vector perpendicularly oriented to the longitudinal axis thereof to effect neutralisation of its weight, whereby ball 1 floats without touching the walls of channel 4, this resulting in the elimination of the even minimal friction of contact with material bodies such as the walls of channel 4 wherein the ball is moved and guided.

[0017] The electromagnetic catapult 2 and also collector of the ball 1 is constituted by conductors 7 of supply of the coil 5 of the electromagnet, an intangible centre of magnetic flux 6, an outlet 1b of the circular section of channel 4.

[0018] Ball 1 with an electromagnetic behaviour, a non compressible basement 1a, a material rubber gasket 8 in between 1 and 1a and (a') the almost linear orbit of the stroke of ball 1.

Operation

[0019]

Phase 1. Ball 1 of ferromagnetic behaviour is located motionless leaning onto the rubber gasket 8 in between ball 1 and basement 1a.

Phase 2. A power current pulse is applied on coil 5, thereby creating an intensity of magnetic field on the electromagnet dependent from the product of the number of turns in coil 5 times the intensity of current in Amperes.

Phase 3. Ball 1 is attracted to point 6, wherein has developed the maximum magnetic flux into channel 4, channel 4 being void from magnetic bodies apart from ball 1 that moves towards magnetic core 6 of electromagnet 5.

Phase 4. In minimal time, just a few msec prior to the geometrical centre of ball 1 coinciding with 6, the pulse is interrupted; ball 1 has however already been supplied with kinetic energy and as a result of inertia thereof, it moves with speed v and in the same time with its mass m it has acquired an impulse j, where j=m.v, thereafter moving and without any electromagnetic effect being exerted thereupon being guided by channel 4 that provides direction to the same, it passes through channel 4 and after exiting the latter, being completely free from any contact whatsoever, strikes the bell 3 at point 3a.

Phase 5. Immediately after the percussion by ball 1 at point 3a of bell 3, the vector of movement thereof after bouncing due to elastic percussion, is turned by 180° and comfortably enters through the orifice of channel 4 that is located at a distance a' from the surface of bell 3 being rung, wherein distance a' is smaller than the diameter of ball 1 that thereafter follows the laws of inclined level (x, y, z) and rolls or is pulled with very small friction because of the point contact in the interior of channel 4 and heads towards the non compressible basement 1a being accelerated until it collides onto rubber gasket 8 that stops its inelastic collision onto 1a. To effect a reduction of the limited time of return to 1a, because of its movement along the inclined level (x, y, z), we provide the ball, in addition to the kinetic energy from gravity, through activating electromagnet 5 by means of a current pulse, immediately after its entry into the orifice 1b of channel 4, said pulse being interrupted shortly prior to the geometrical centre of ball 1 approaches at a minimal distance from 6.

Ball 1 moves through the distance a' completely free from any material mechanic linkage with a material body whatsoever.

Ball 1 has now acquired an impulse j with an increase in the acceleration thereof and a reduction at the degree required of its time of return back to 1 a.

Phase 6. With the scope of regulation of the intensity of percussion, we apply an electric power pulse at coil 5 that acts so as to inhibit the impulse j being obtained and at a time of a very few msec prior to the percussion at point 3a of bell 3. The result is impressive and unusual in electrodynamic percussions of bells, where herein practically prevails the elimination of frictions because of the point contact of ball 1 within channel 4 thereby creating a condition wherein ball 1 is being rolled and is not pulled encountering very small resistances that might occasionally develop within channel 4 of its movement. Still in order to succeed practically zero friction, we apply a method of floating thereof by appropriately modulating the spectrum of magnetic flux of 5, whereby ball 1 is under the effect of a vertical attractive force that momentarily neutralises its weight, thereby being elevated even marginally during its movement in channel 4. without coming in contact with the same and thereby striking point 3a of bell 3 when it exits channel 4.

Clarifying comment

[0020] With regard to the interruption of the electric power pulses that we apply before the geometrical centre of ball 1 encounters the intangible magnetic flux center 6 that is a region and a space of maximum density of magnetic flux, it is essential to effect this interruption so as to exclude the possibility of a non intended inhibitive effect in the speed it has acquired, because if ball 1 decreased the magnetic resistance of the flux of the electromagnet in the gap of the empty channel 4, it would have been retained within 6 and depending on the duration of the pulse it could even be immobilised. This will take place because the μ of the magnetic behaviour of ball 1 is very large in comparison with the 1μ of air in channel 4. The properties of ball 1 in which the inertial centre, the magnetic centre, the centre whereupon forces are being applied and its centre of gravity all coincide with its geometrical centre and render the same an unrepeatable carrier means of kinetic energy, with a high compliance in commands, but also a unique direct point impact element onto bell 3. Ball 1 immediately after its exit from orifice 1b of channel 4, runs through distance a' between 1b of 4 and 3a of 3, following the laws of projectile. The ball practically has a linear movement and during moving through a' it is completely free from any mechanical linkage to any solid body whatsoever. This situation characterizes the innovative and original element that renders the invention novel. The herein reported qualitative parameters of the invention relating to the percussion of bells with a freely moving ball 1 provide for quantitative calculations known in modern science and

technology with an unlimited extension in electrical and mechanical dimensions for the composition of throwing mechanisms for bells of all kinds and all sizes.

Claims

1. Ball of clearly geometrical form, solid material composition, thrown for the percussion of bells of Churches and relevant applications. In Greece and other countries systems of percussion of bells of churches etc. employing piston operated percussion mechanisms of an electromagnetic behaviour are in operation. In these systems, between the advantage of use of electric energy for their operation, there exist disadvantages, such as: large frictions, use of return spring, almost inelastic percussion because of the mechanical linkage of the percussion element with the heavy mass of the entire mechanism that is mounted in the interior of the bell. An alteration of the sound of the bell is also observed due to the same reason. A small frequency of percussions per 1 " of an hour. Inertial weakness of varying the intensity of percussions and the frequency thereof, as well as other secondary disadvantages. The percussion of bells, with a ball (1) being thrown is **characterized by** that there do not exist practically any frictions during its movement, Fig. 1 within channel (4) and guiding means of the same. Throwing can be realised in any manner whatsoever, ball (1) having to travel a distance (a') in its course towards point (3a) of bell (3) in order to ring the same, such distance (a') being the range of ball (1) that is completely free from any mechanical linkage when striking onto point (3a) of bell (3), with an elastic percussion, thereby bouncing and changing the vector of movement thereof by 180° and entering into orifice (1b) of circular section of channel (4), thereafter following the laws of inclined level (x, y, z) in heading towards non compressible basement (1a), on the other side of which there is provided a rubber gasket (8) whereupon it collides with an elastic collision. The kinetic energy for throwing ball (1) to bell (3) was given by an electric power pulse that activated electromagnet (5) and caused an attraction effect exerted onto (1) of electromagnetic behaviour. For control we use electric power pulses for all actions of varying the intensity and frequency of percussions of ball (1) per 1'' of an hour. We activate coil (5) of the ball catapult-collector (2) that always, upon being excited, attracts ball (1) to point (6) that is a point of maximum magnetic flux of coil (5), independently of the location of ball (1) within channel (4). Herein we naturally selectively and not restrictively make use of an electromagnetic catapult-collector (2) of ball (1). Ball (1) begins its reciprocating movement with the departure from (1a) following the route within (4), exiting through the end of (4) at (1b) and consequently heading towards (3a) of (3) that is the course of its orbital range (a'), it elastically collides onto (3a) of (3), bounces and changes its vector of movement by 180°, now heading towards (Ia), with an elastic collision thereof at (8) and its immobilisation. Also in (5), we comfortably achieve varying the intensity and frequency of percussions per 1'' of an hour. Such control is made possible due to the permanent attraction of (1) to point (6) of (5) independently from the location thereof within (4) in each excitation of (5). The pulses are always interrupted prior to the geometrical centre of (1) approaches to becoming concentric with (6). Throughout all these phases of operation thereof and especially during its passage through (a') that is the range thereof and during its percussion onto (3a) of (3), ball (1) is completely free. The production of electric power pulses of digital technology is known in Electrical technology. The electric power pulses may be from a d.c. or a.c. single phase or multi phase supply.

2. Ball of clearly geometrical form, solid material composition, thrown for the percussion of bells of Churches and relevant applications that according to the broadness of claim 1 is **characterized by** the handiness in the selection of any material whatsoever for the manufacture of ball (1) and for the architectural layout and operation of the catapult-collector (2).

3. Ball of clearly geometrical form, solid material composition, thrown for the percussion of bells of Churches and relevant applications that is **characterized** so much by the free selection of materials of manufacture thereof, as well as of the catapult-collector (2) and is dependent from claim 2, with the choice of ball (1), Fig. 1 metallic and of an electromagnetic behaviour, catapult-collector (2) to collect ball (1) following percussion thereof onto (3a) of (3), channel (4) within which at approximately the middle of the same there is wound coil (5), a rubber gasket (8) onto non compressible basement (1a) for preventing any inelastic collision of ball (1) thereupon. An end (1b) of the circular section of channel (4), that is located at a distance (a') from the wall of (3), such distance being smaller than the diameter of ball (1). The supply of kinetic energy to (1) is effected through excitation of (5) by an electric power pulse, that attracts ball (1) in the direction of coincidence of its geometrical centre with point (6) of maximum magnetic flux of (5). This is done irrespective of the point within (4) where ball (1) is located. The supply of kinetic energy to (1) in any location thereof within (4) is implemented through excitation of (5) by an electric power pulse. Operation: (1) is still onto (8) of basement (1a). We excite (4) by means of an electric power pulse. Ball (1) is attracted towards (6) of (4) and acquires an impulse j=m.v as it moves towards (6), whereby prior to the geometrical centre thereof

coinciding with (6), we interrupt the power pulse in (5). Because of the inertia of material bodies, ball (1) continues its movement, passes through (6) that is presently inactive, covers the distance (a') that is the range thereof, and collides onto (3a) of bell (3). Immediately after the percussion, (1) bounces as a result of the elastic collision and the vector of movement thereof is inverted by 180° relatively to that of initial movement thereof and thereafter ball (1) covers distance (a') and enters into orifice (1b) of (4) and following the laws of inclined level (x, y, z) moves towards (1a), whereupon it elastically collides because of rubber gasket (8).

By means of appropriate electric power pulses, both as ball (1) moves towards (3a) of (3), we can accelerate or slow down the course of (1) and the intensity of percussion thereof, and we can also control the acceleration of return thereof towards (la), the basic condition being that we interrupt them prior to the geometrical centre of (1) coincides with (6) of (5).

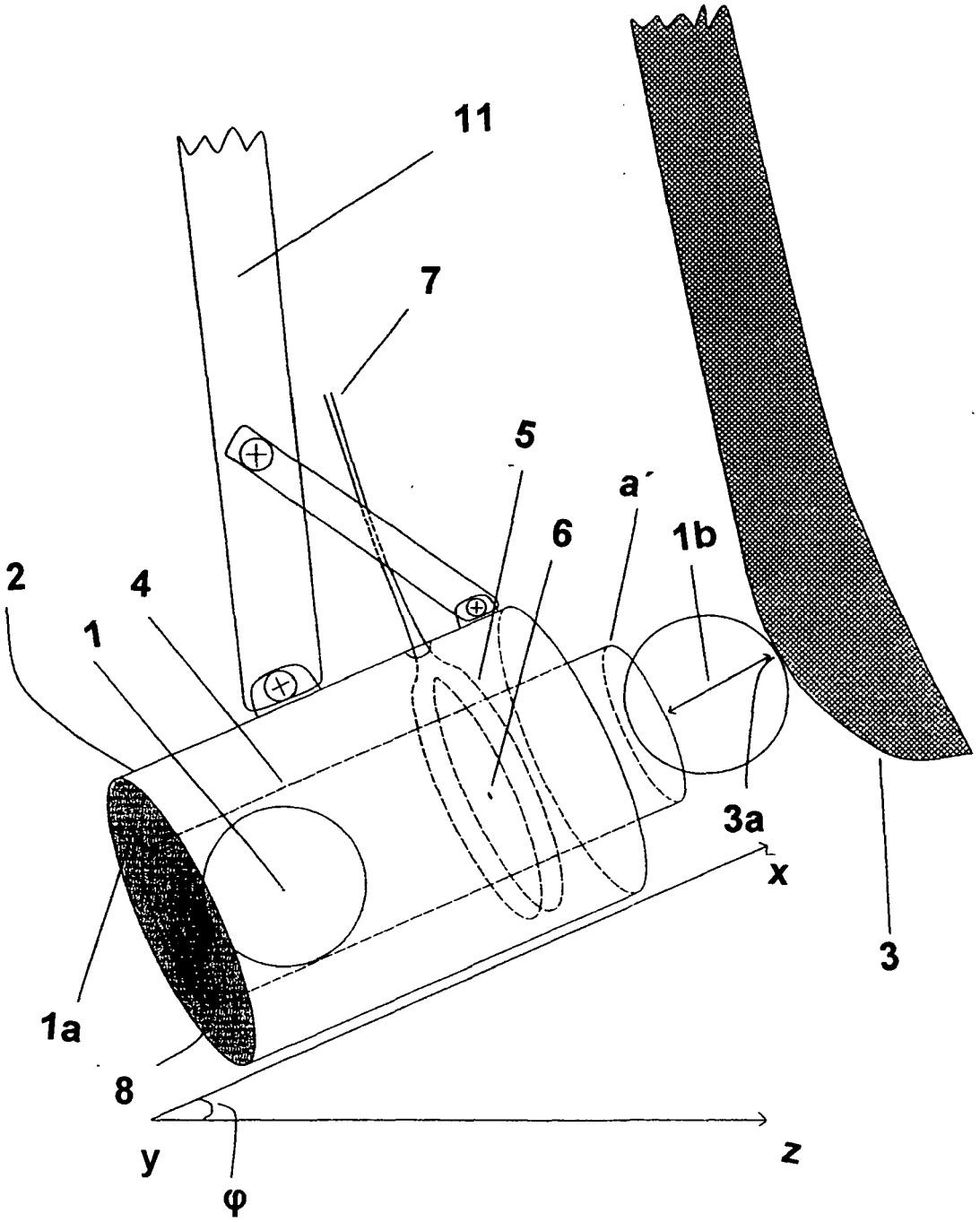
The production of power pulses is known in the art of modern electrical and digital technology. With the use of ball (1) of electromagnetic behaviour within a time and intensity controlled electromagnetic field, (2) is a reliable means of throwing and collection of ball (1), its concrete mission being to throw ball (1) for the percussion of (3) and to guide it towards (1a) for repeating its reciprocating movement.

4. Ball of clearly geometrical form, solid material composition, thrown for the percussion of bells of Churches and relevant applications, Fig. 2, electromagnetic catapult-collector (2) of ball (1) that is **characterized by** that activation of (5) is effected by means of interrupted electric power pulses via conductors (7), that pass through aperture (9) provided at junction (10) of sonar vibrations of (3) that is suspended from junction (10). The passage of conductors (7) through aperture (9) is compatible with the passage through a Feed Through capacitor that is known in radioelectric technology as an element of selectively isolating passage of undesirable parasitic currents. In parallel with the electric grounding of bell (3) that henceforth additively functions as a Faraday cage, we achieve the necessary reduction of electric inductive phenomena and of electromagnetic radiation that are being produced by the transient phenomena of the electric power pulses employed for activation of the coils of any electromagnetic percussion means of the bells whatsoever.

The European Union with its decision (E.M.C.) prompts for application of methods of reduction of the inductive and magnetic fields and radiation, this decision becoming applicable also in Greece from 1/1/2007.

Aperture (9) is easy to form during casting of the bell (3) at junction (10), and if not foreseen during casting, it might be formed with a special tool without by any means influencing the sound performance of bell (3).

Fig. 1



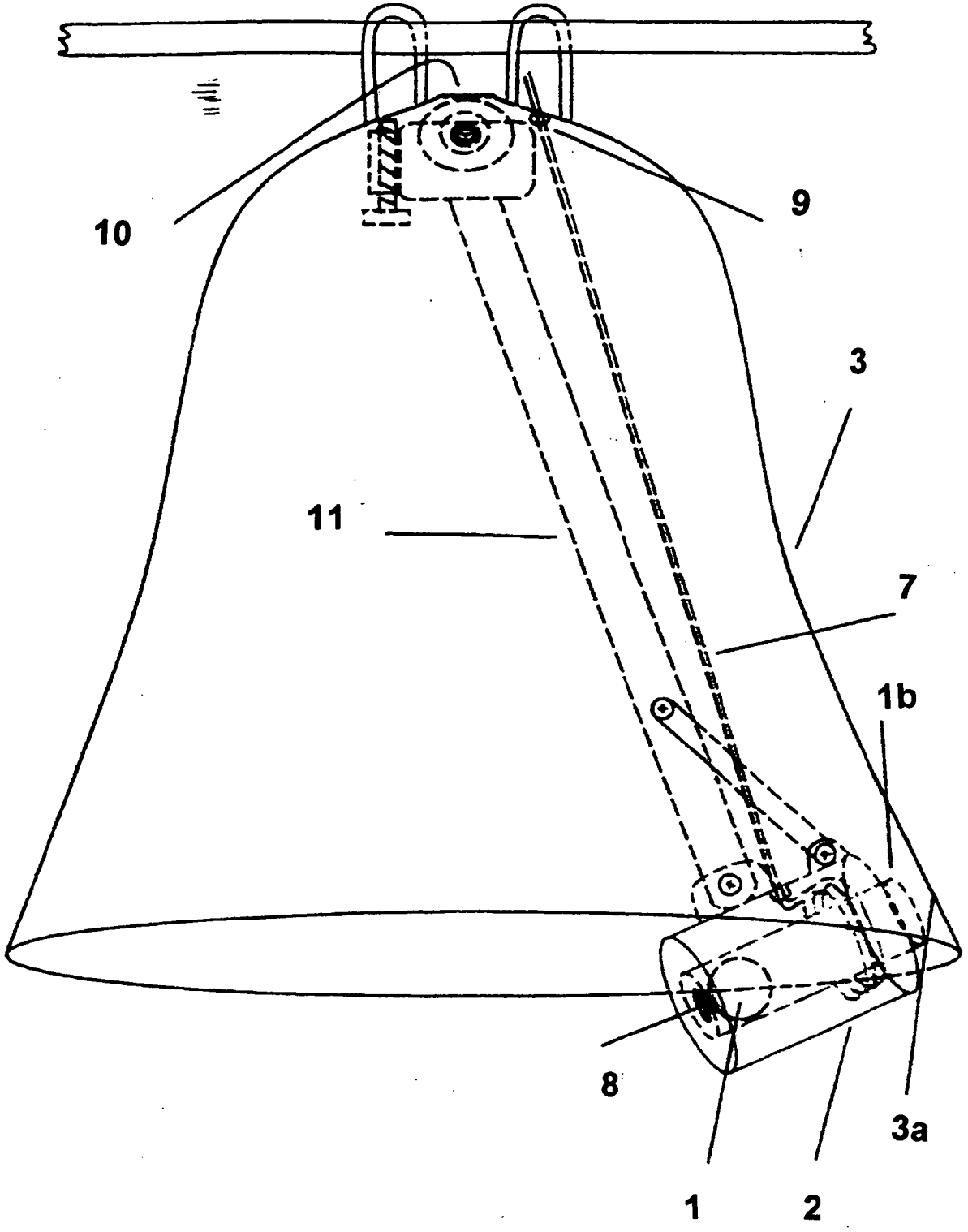


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- GR 35370 **[0002]**
- GR 35262 **[0002]**