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IMPACT DEVICES FOR ELECTRONIC GOLF DRIVE INTERPRETERS

Filed Jan. 7, 1955

4 Sheets-Sheet 1

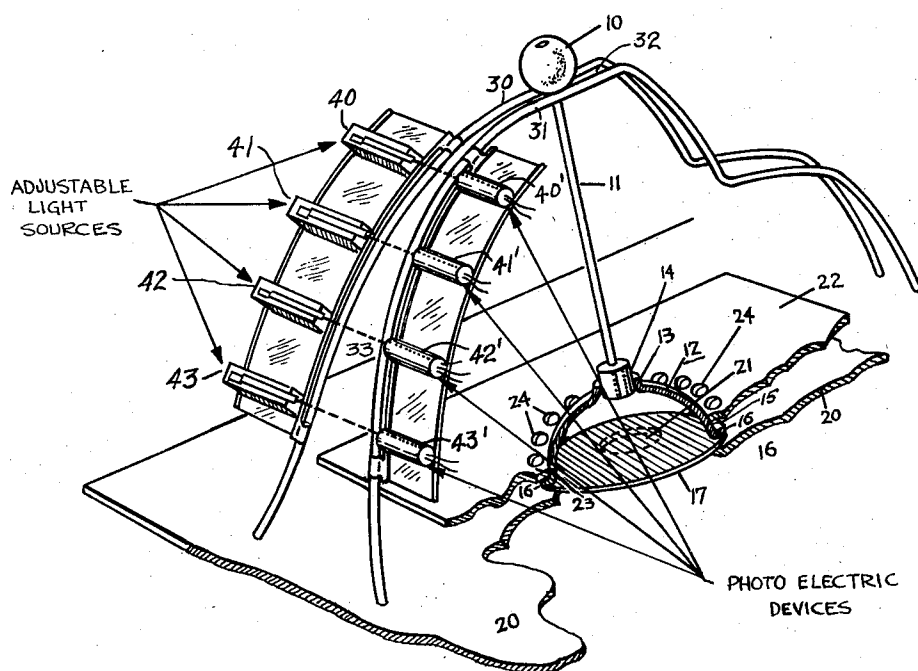


Fig. 1.

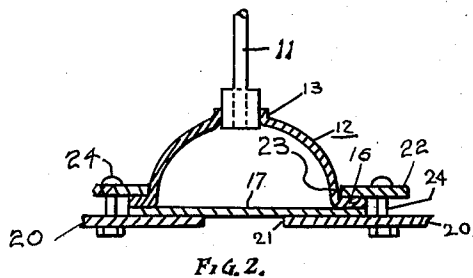


Fig. 2.

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4 Sheets-Sheet 2

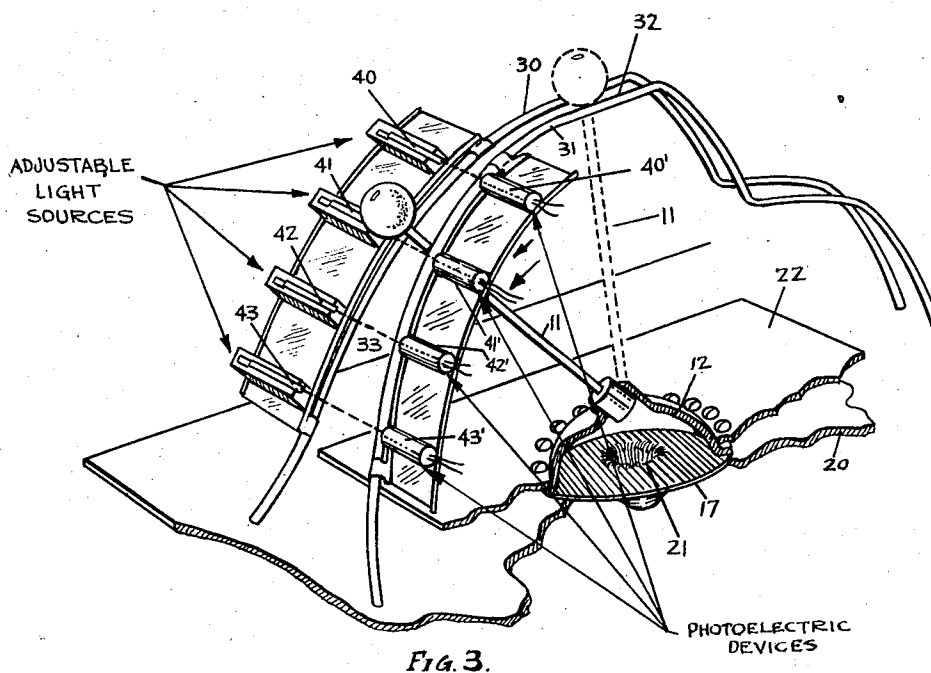


Fig. 3.

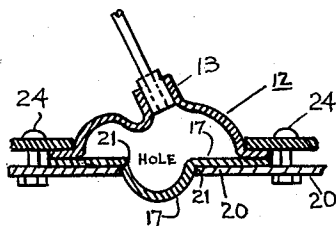


Fig. 4.

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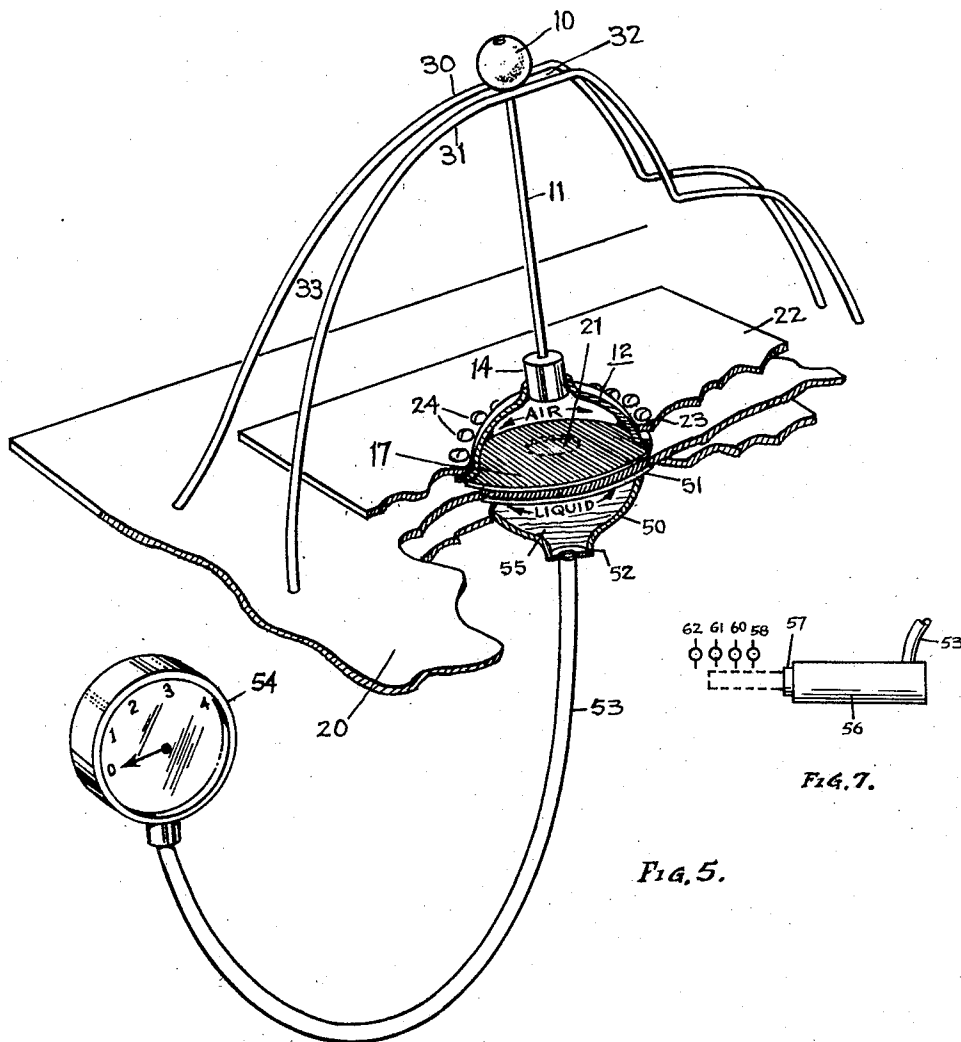
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4 Sheets-Sheet 3



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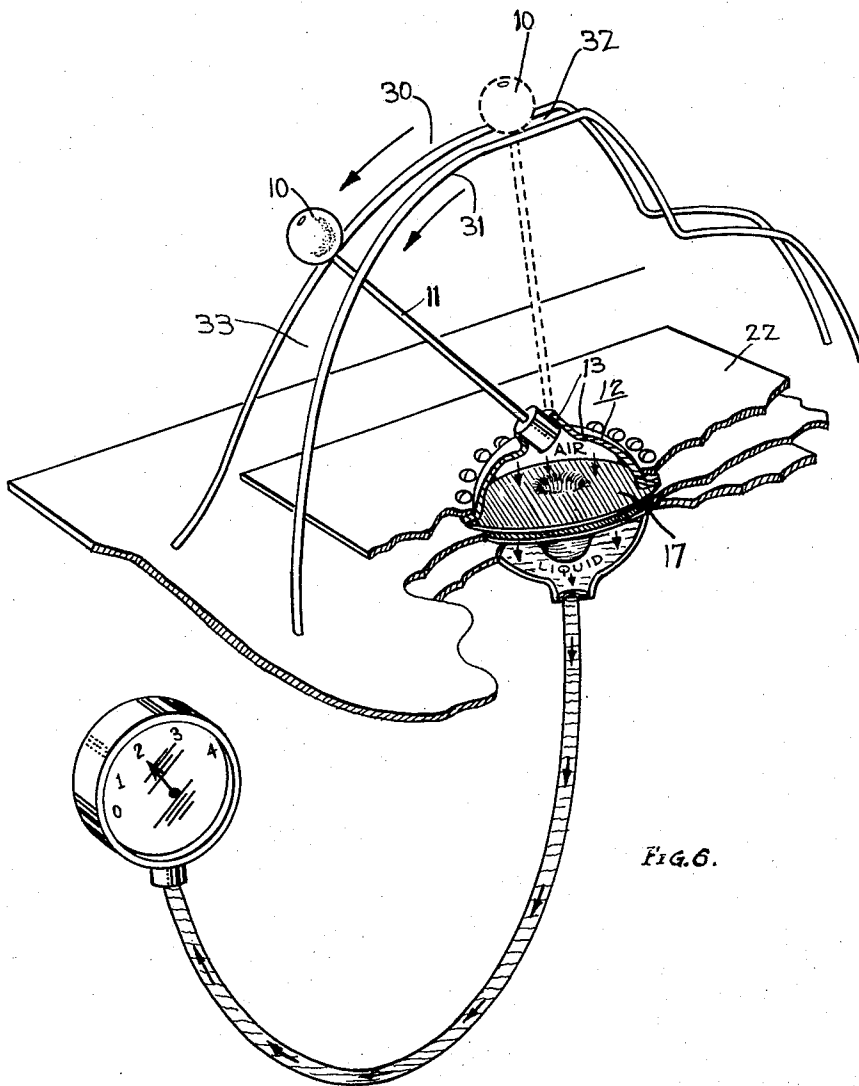
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4 Sheets-Sheet 4



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IMPACT DEVICES FOR ELECTRONIC GOLF DRIVE INTERPRETERS

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Application January 7, 1955, Serial No. 480,546

9 Claims. (Cl. 73—379)

This invention relates to impact devices for electronic golf drive interpreters, and pertains particularly to improvements on the impact mechanisms shown in the application of Rexon, Serial No. 456,854, filed September 17, 1954, and now abandoned.

In impact mechanisms of the type involved a ball or ball simulation is mounted on a supporting rod in such spacing relative to a platform on which the golfer stands that in its static position of rest the ball simulation is effectively teed at the ordinary average tee setting for a drive. When struck by the golfer it is driven on a path about a general pivot, with motion-damping means associated with the device, to absorb impact energy, so that the actual arcuate travel of the ball and its support is a function of the force of impact. This impact device is associated with a series of electric signalling means in such manner that the degree of ball movement pursuant to impact determines the ultimate energized signal of the series as a function of the impact, which signal may be designated as the impact value.

In other efforts to effect a proper impact response the ball simulation has been mounted on a rod having an effective pivot, with dash pot or the like energy-absorbing devices associated therewith, to limit the actual movement of the ball simulation in response to the given impact.

It has been discovered that the shocks of repeated club head impacts have a disastrous effect on the entire organization of ball simulation, rod and pivot, and that the dash pot type of shock absorber as previously used is not only expensive, it is only of fair life and efficiency.

It is among the objects of this invention to improve impact devices for receiving and measuring or indicating impacts; to provide a ball simulation which of itself can sustain repeated impacts without disruption; to simplify and cheapen the mounting of the ball simulation of impact mechanisms; to provide a hermetically sealed resilient unit with a mounting rod of an impact mechanism, in which distortion is resisted and the initial setting of the mounting rod on the unit is regained by the conjoint action of the resilience of the unit and the gas pressure in said unit; and to provide other objects and improvements as will appear as the description proceeds.

In the accompanying drawings forming part of this description:

Fig. 1 represents a fragmentary perspective of a form of the invention in its condition of static rest, as teed-up on the driving platform and disclosing one form of signal organization.

Fig. 2 represents a fragmentary vertical section there-through.

Fig. 3 represents a view similar to Fig. 1, in which the static-rest datum condition is partially represented by dotted lines, while, in full lines, the ball simulation, mounting rod and effective pivot device are shown as having attained a position on the path of movement thereof spaced from the datum initial setting, as the result of a given impact from a device such as the head of a golf club.

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Fig. 4 represents a fragmentary vertical section there-through in the full line position of the ball-mounting rod.

Fig. 5 represents a view similar to Fig. 1, in which a modified signal device and its energizing apparatus is disclosed, with the ball simulation in its static rest position.

Fig. 6 represents a view similar to Fig. 3, with the static rest condition indicated partially in dotted lines, while in full lines the ball simulation, its mounting rod, and its effective pivot device, are shown as having attained a position on the path of movement thereof as the result of a given impact from a golf club, such as a driver, with the fluid pressure signals indicated by variations in fluid pressure on a visual indicator.

Fig. 7 represents a schematic representation of a device controlled by fluid pressure for effecting electrical signals of impact value by the modification of Fig. 5.

The cutting and other disruptive effects of repeated impacts from a smartly swung golf club head and the average ball simulation is remarkable, especially when the ball simulation is so anchored that it has only a relatively fixed path of movement on which to react, and the provision of a material which in shape and general appearance resembles a golf ball, but which will stand much more in the way of repeated impacts than an actual golf ball is a difficult matter. After a great deal of research and empirical effort, it has been discovered that a material of high utility in the connection is a sphere of polyethylene. This material can take repeated cutting impacts, reacts in sound and motion in a manner very similar to the reaction of conventional golf balls, and after a certain degree of roughening, or abrasion, or even cutting, can be smoothed off for further use by the application of heated metal. This seals cuts and, in effect, glazes the entity for further useful life. This material is illustrative, but preferred, for the ball simulation 10 hereinafter referred to as the ball. The ball 10, however made, is axially bored for mounting on the upper free end of a metal rod 11, as by adjusting nuts or the like on opposite sides of the ball, as will be clear. This mounting enables the rapid replacement of one ball by another when this may be necessary.

An important feature of the invention is the provision of a deformable resilient rubber or like generally hemispherical mounting device 12. This device in its main parts is similar to the leading end of a conventional plumbing adjunct called a plunger. The resilient deformable element, for convenience, will be designated as the plunger or device 12. The plunger or device 12 has a neck 13, in which, as by an adapter or enlargement 14, the lower end of the rod 11, is hermetically sealed and mounted. The device 12 is generally hemispherical and has a wide skirt 15 terminating in a peripheral external flange 16 lying in a terminal plane generally normal to the axis of neck 13. An initially planar sheet 17 of resiliently deformable material, such as rubber, is hermetically sealed to the skirt under the flange and across the planar surface thereof. This constitutes the device as a sealed, gas-containing deformable device.

In one form of mounting of the device, a sheet of metal 20 having an aperture 21, is mounted on a suitable support below the platform of the drive apparatus. A clamping sheet of metal 22 is provided, having an aperture 23 large enough to pass over the skirt 15. The ball, rod, and pivot organization is placed on the lower metal plate 20 with the lower planar rubber sheet 17 concentric with the small aperture 21, then the clamping sheet 22 is placed over the flange 16 of the plunger element, compressing the flange and the lower rubber sheet against the base plate 20. Suitable screws 24 or the like are applied between the parts to hold the plunger element immovably on the base and to maintain its hermetic seal. With the hermetic ball or general half ball under

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its own symmetrical stresses the rod 11 rises until its axis is normal to the bottom sheet of rubber 17 and to the plane of the lower edge of sheet 15. In this position the ball simulation 10 is elevated and simulates a teed-ball with reference to the playing or driving platform, not shown. If desired, the datum position of the rod 11 may be in a different angular relation to the plane of the lower edge of this skirt 15. When the ball is struck, as indicated in Figs. 3 and 4, the plunger element is deformed as indicated, as the ball moves arcuately.

In the full line position of Fig. 3, the ball has moved so that the axis of the rod 11 is moved out of its initial datum relation to the plane of sheet 17, as, for instance, out of the perpendicular, and thereby the volumetric capacity of the device is reduced as the downstream side thereof buckles or yields in accommodating to the different angle of the rod, and partially collapses on that one side. This compresses the air entrapped in the plunger unit, which is partially relieved by forcing the thin rubber sheet into a downward bulge or protrusion through the small aperture 21. The ball meanwhile has moved arcuately downwardly from its teed disposition, the extent of which movement is functional with the impact value against the ball simulation. When the ball and rod reach the maximum angular distortion from the datum setting attaching to the instant impact, marking the absorption of the impact energy, there are two forces tending to return the rod to its initial datum attitude. One is the resilience of the plunger tending to return to its initial position, and the other is the compressed air in the plunger which has loaded the rubber sheet, and the resilience of which is such that it tends to return to its planar condition thus exerting internal compression against the plunger to aid it to return to normal.

As shown in the said Rexon application Serial No. 456,854, it is preferred to provide lateral guide plates, to guide the rod in its return to normal or datum and to absorb some of the energy of shots struck out of line. While in the platform organization presently preferred the drive interpreter will be either for a right hand driver or for a left hand driver, and not for both, to take care of both hooks and slices, there are two guides provided. These may take the form of stiff wires 30 and 31, bent and curved on general arcs concentric with the path of the ball to form a relatively narrow slot 32 at the upper portion and a wider tapered slot 33 at the lower end, defining a continuous slot for rod movement.

It being recognized that in response to an impact the ball simulation is driven a certain distance on its generally arcuate path, after which it is automatically returned to its initial setting, it is desirable to propagate a signal to indicate the extent or degree of travel of the ball simulation on its path. While this may take any desired form, as by having the rod 11 successively trip switches or the like on its inward or outward path, as may be found most expedient, as disclosed in said Rexon application Serial No. 456,854, it may be preferred to utilize the movement of the rods 11, or any other movable portion of the impact assembly, to energize photo-electric tubes by intercepting light rays incident thereon. Thus, as shown in Figs. 1 and 3, the guide rods or plates 30 and 31 may be used to support respectively light ray sources 40, 41, 42, and 43, and the respective aligned photo-electric tubes 40', 41', 42', and 43'. These signaling units can be integrated with a receiver system responsive to the progressive signals energized or actuated by the movable rod, or the like, of the impact mechanism.

A further form of signal is available from the invention utilizing the deformation of the resilient device upon impact. This signal may be of the fluid pressure type. As shown in Figs. 5 and 6, the upper portion of the device is similar to the form shown in Fig. 1, and bears the same reference characters.

In this form of device a complementary plunger type device or element 50 is provided, of the same general

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description as the rod-mounting plunger 12. This has the same flare and skirt organization and also mounts a generally planar resilient sheet element 51. If desired, the upper resilient sheet element 17 may be common to both the upper and lower plunger devices. It is preferred, however, to provide the separate element 51 as it facilitates insertion and servicing of the instrument. The reduced coaxial neck 52 is connected in sealed relation to the conduit 53 leading, for instance, to the pressure meter 54. The plunger device 50, conduit element 53, and the pressure meter 54 are filled with a solid column of fluid, and preferably a liquid as at 55.

As indicated in Fig. 7, the pressure meter 54 can be replaced in the pressure line 53, or augmented thereon, by a circuit-controlling unit 56. The latter unit incorporates a spring-loaded piston 57, which projects from the unit 56 a degree functional with the instantaneous pressure in the plunger 50 and line 53, operative against the piston. A series of electrical switches, such as 58, 59, 60, 61, and 62 are mounted, with their respective actuated members, in the path of movement of the piston 57 to be successively energized thereby.

Impact on the ball simulation swings the ball and rod on their common effective pivot in the plunger device 12. Functionally with the force of the impact, the fluid pressure in the plunger 12 distorts the sheet 17 either against the fluid column in the lower portion of the modified device, or against the planar sheet 51 of the lower plunger device 50. In any case, the swinging of the rod and ball relative to the plunger element compresses the entrapped air in the upper plunger element and thereby causes the lower planar sheet 17 to deform and move in a bulge downwardly through orifice 21 in the plate 20. This distortion either directly or indirectly loads the fluid column causing the pressure meter 54 to indicate the increased pressure incident to the impact energy, as a visual function of the impact force on the ball. Simultaneously, or separately, or alternatively, this may actuate the pressure-responsive device 56, to move the piston 57 outwardly, again as a function of the impact force, to actuate one or more of the switch organizations 58 to 62 inclusive, to cause the transmission of electrical signals according to the instant impact force.

The cheapness and ease of replacement of the various parts of the invention, and the advantages and utility thereof, will be manifest.

It is to be observed as an important factor that the plunger, rod, and ball simulation are so organized that the ball and rod have practically "free flight" for two or three inches from the datum teed position following impact. This is controlled by the size of the hole in the bottom plate permitting plunger flexing absorbed instantaneously by the flexing of the lower diaphragm into hole 21. This "free flight" motion is attained with both forms of the invention disclosed and is an important attribute of the impact mechanism in its intended use. This is for the reason that the "free flight" range of two or three inches in the arcuate motion of the ball permits the club head to get past the ball, while imparting to the player the sensation of striking a teed-up golf ball.

It will be obvious to those skilled in the art that various changes and modifications may be made in the invention without departing from the spirit and scope thereof, and such are to be construed as part of this invention.

Having thus described my invention, I claim:

1. An impact mechanism comprising a generally hemispherically hermetically sealed gas-filled resilient element, rod means terminating in and mounted on the element in datum angularity thereto, ball simulation means on the rod means to receive impacts to force the rod means to a position out of datum to distort the element and increase the pressure of the gas therein to assist in returning the rod means to its datum angularity after an impact, and means to generate at least two temporally

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successive signals representative each of the location of said rod means at a position in the path traversed thereby in response to such impact.

2. An impact mechanism comprising a resilient generally hemispherical element having a generally planar edge, means mounting the element with the planar edge immovable, rod means terminating in and mounted on the element in position to extend in a direction generally normal to the plane of said planar edge and having a free end for mounting an impact-receiving element, said rod means being movable about a general pivot formed in the resilient element in response to impacts applied to said impact-receiving element to distort said resilient element against its resilience, whereby the resilience of said resilient element after such distortion urges it to resume its initial generally hemispherical contour to move said rod means back into general normality relative to said plane of said planar edge, and means to generate at least two temporally successive signals representative each of the location of said rod means at a position in the path traversed thereby in response to such impacts.

3. An impact mechanism comprising a resilient hermetically sealed gas-filled element closed on one side with a sheet having a generally planar flange, rod means terminating in and attached to the element and having an initial angular relation to said flange, said element having a free end to mount an impact-receiving unit for moving said rod element to change its angular relation to such flange in response to an impact while distorting the element to change its angular relation to such flange while changing the pressure of the gas therein, whereby the return of said rod means to its initial relation is as a result of the pressure of the gas in said element and the resilience of the element, and means fixed in position with respect to said flange to generate at least two temporally successive signals representative each of the location of said rod means at a position on the path traversed thereby in response to impact applied to said unit.

4. An impact mechanism as recited in claim 3, in which said generally planar surface is resilient, and means establishing a fluid column subjected to pressure as the generally planar surface is distorted in response to increase of pressure of the gas in said element in response to movements of said rod means.

5. An impact mechanism as recited in claim 3, in which said generally planar surface is resilient, means establishing a fluid column subjected to pressure as the generally planar surface is distorted in response to in-

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crease of pressure of the gas in said element in response to movement of said rod means, and signal means actuated by said fluid column.

6. An impact mechanism as recited in claim 3, in which said generally planar surface is resilient, means establishing a fluid column subjected to pressure as the generally planar surface is distorted in response to increase of pressure of the gas in said element in response to movement of said rod means, and signal means actuated by said fluid column, said signal means comprising pressure-responsive means.

7. An impact mechanism as recited in claim 3, in which said generally planar surface is resilient, means establishing a fluid column subjected to pressure as the generally planar surface is distorted in response to increase of pressure of the gas in said element in response to movement of said rod means, and signal means actuated by said fluid column, said signal means comprising visual means controlled by the instant pressure on said fluid column.

8. An impact mechanism as recited in claim 3, in which said generally planar surface is resilient, means establishing a fluid column subjected to pressure as the generally planar surface is distorted in response to increase of pressure of the gas in said element in response to movement of said rod means, and signal means actuated by said fluid column, said signal means comprising expansible means and electric signals actuated functionally with the expansion of said expansible means.

9. An impact mechanism comprising a ball simulation, a support, a resilient deformable element having one portion thereof affixed to said support, means movable with respect to said support linking said simulation and element for deformation of said element upon displacement of said simulation from a rest position, and separate spaced means to generate temporally successive signals representative of the time interval separating passage of said linking means through two positions upon application of an impact to said simulation.

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