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ELONGATED ELECTROACOUSTIC TRANSDUCER WITH INTEGRAL REINFORCED MOUNTING FLANGES

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Fig. 1.

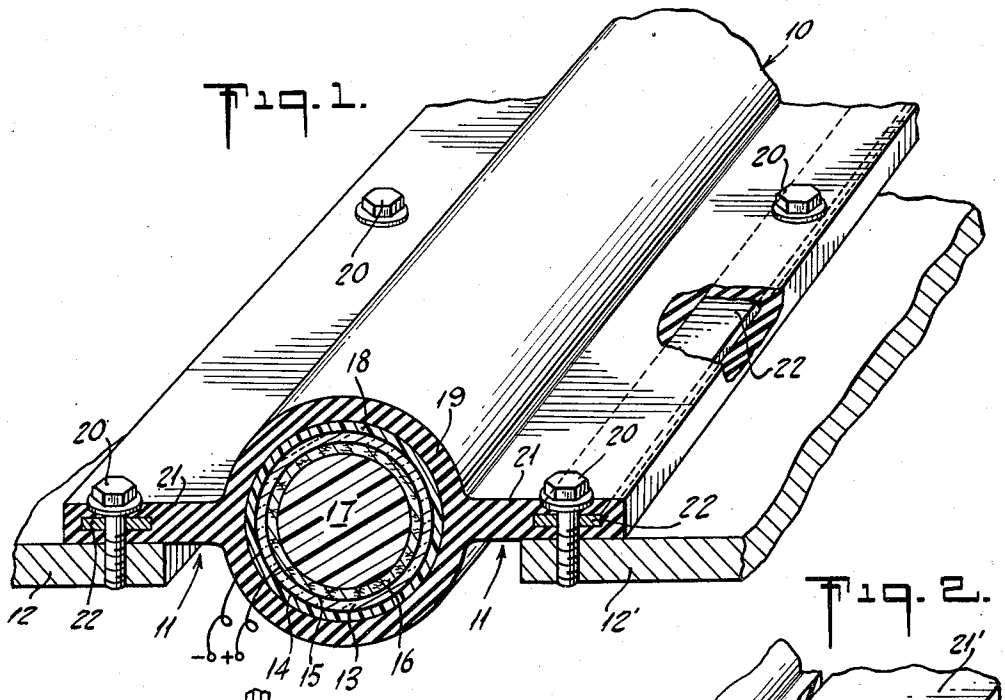


Fig. 2.

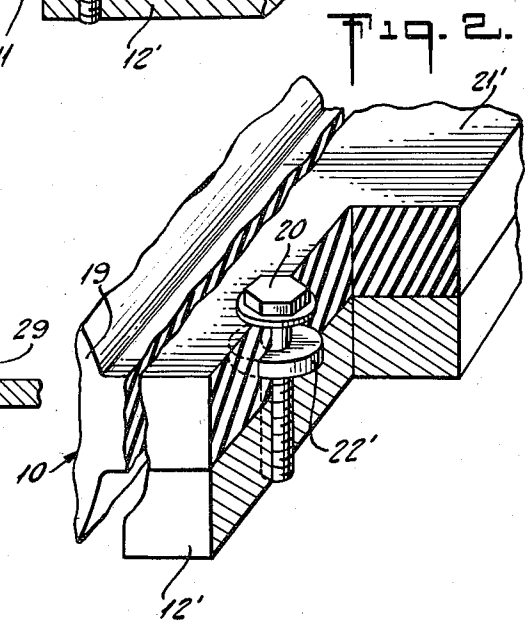
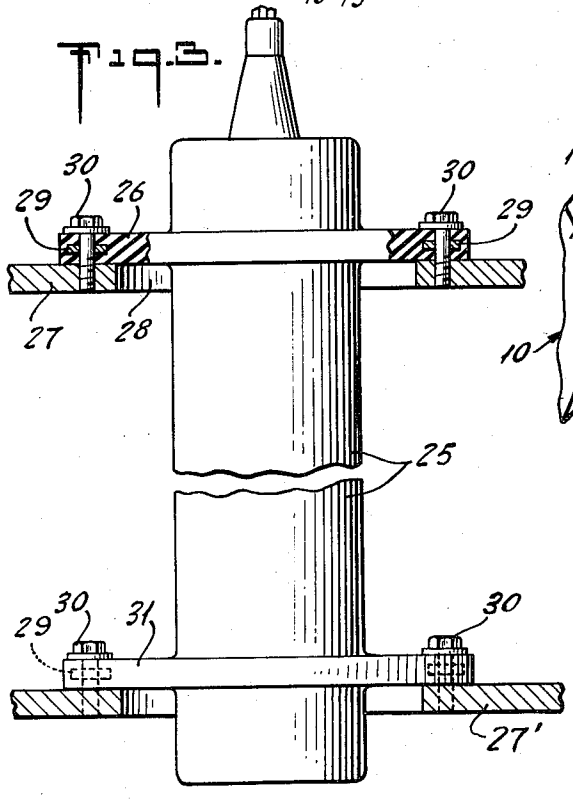


Fig. 3.



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ELONGATED ELECTROACOUSTIC TRANSDUCER WITH INTEGRAL REINFORCED MOUNTING FLANGES

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3 Claims. (Cl. 340—5)

My invention relates to an improved shock-mounting structure, and in particular to a mounting for an electroacoustic transducer adapted to underwater use.

It is an object of the invention to provide improved means of the character indicated.

It is another object to provide an improved flexible mounting for a transducer which will withstand substantial abuse and yet will so freely support the transducer as to isolate the same from mechanical shock sustained by the supporting frame.

It is a specific object to meet the above objects with a structure representing substantial savings in hardware, and without sacrifice of ruggedness.

Other objects and various further features of novelty and invention will be pointed out or will occur to those skilled in the art from a reading of the following specification in conjunction with the accompanying drawings. In said drawings, which show, for illustrative purposes only, preferred forms of the invention:

Fig. 1 is a sectional view taken substantially through a single radial plane of a mounted transducer incorporating features of the invention, certain parts being shown somewhat in perspective from the sectional plane and the lead lines being illustrated diagrammatically, in order better to illustrate the relationship;

Fig. 2 is an enlarged fragmentary view in perspective and partly broken away to illustrate a modification; and

Fig. 3 is a view in elevation of a further modification, with certain parts broken and shown in section to reveal mounting details.

Briefly stated, my invention contemplates application to the mounting of an elongated transducer, such as an electroacoustic transducer suitable for underwater use. The transducer is secured within an opening in or spaced between rigid frame-support means, and flexible flange or web means bonded to or integral with the transducer extend radially from the axis of the transducer in overlapping relation with parts of the frame support, near the inner limit thereof. The radial space between the transducer and the inner limit of the frame opening is preferably substantial, so that substantial radial length of yieldable support is provided.

In one general form of the invention, the yieldable web or flange is elongated and substantially coextensive with the length of the transducer, and it extends radially outwardly from the axis of the transducer at angularly spaced locations. In the other general form, the yieldable web or flange is an annular skirt at a particular axial location along the length of the transducer, and, if desired, a plurality of such skirts may be provided at such axial spacings and in such plurality as dictated by application requirements.

Referring to Fig. 1 of the drawings, my invention is shown in application to the mounting of an elongated cylindrical transducer **10** within an opening **11** defined between spaced opposed frame means **12—12′**. The frame means **12—12′** may be part of the same rigid strip, merely slotted at **11** to provide the mounting space; alternatively, the frame means **12—12′** may be separate members rigidly secured (by means not shown) to each other.

The transducer **10** may be of the magnetostrictive variety, but in the form shown I suggest that the principal element of the transducer is an electrostrictive cylinder **13** having electrode foils **14—15** on the inner and outer walls thereof, for deriving an electrical response to pressure fluctuations incident on the transducer to produce an instantaneous potential shown by the plus and minus signs on the lead lines in Fig. 1. In order that the response may be primarily to externally incident pressure fluctuations, I show pressure-release means, such as a layer **16** of cork, Corprene, cardboard, or the like, radially within the electrostrictive cylinder **13** and permanently held in place by an internal potting **17** of suitable plastic. The transducer proper may also include an outer protective sheath **18** of sound-transmitting plastic intimately bonded to the electrode **14** and to the electrostrictive cylinder **13**; the plastic used for potting and for the cover **18** may be one of a variety of hard plastics, as, for example, epoxy resins. For further protection against abuse, an outer boot or jacket **19** may be bonded to the hard plastic layer **18**, and I prefer that this outer boot be of rubber-like material, such as neoprene, and relatively thick, as shown. All materials external to the cylinder **13** must, of course, be sound-transmitting.

In accordance with the invention, I yieldably support the described transducer within the frame opening **11** by means of webs or flanges **21** extending radially of the transducer **10** and overlapping the supporting frame means **12—12′** to permit rugged securing, as by bolts **20** spaced along the length of the regions of overlap. The webs or flanges **21** extend radially from the axis of the transducer and may be bonded to or formed integrally with the boot **19**; my preference is to form both the boot **19** and the flange means **21** at the same time, so that the flange means may assuredly be integral with the transducer.

In order to enhance the securing effectiveness of bolts **20**, I prefer internally to reinforce the flange means **21**, as by metallic means **22** bonded within the flange means **21**. In the form shown in Fig. 1, the reinforcing means **22** is an elongated strip for each flange. The strip **22** may be coextensive with the longitudinal extent of the flange, but is preferably bonded only within that part of the flange which overlaps the securing frame **12**. Stated in other words, the radial extent of the flange **21** is preferably such that a substantial unreinforced portion exists for the radial space between the transducer and the inner limits of the opening **11**, thus providing free suspension, particularly insofar as transverse movement (relative to frame means **12—12**) is concerned.

In Fig. 2, I show a slight modification, in which the metal reinforcement means **22′** within the web or flange **21′** is a washer, it being understood that such washers are provided in such plurality as necessary for the plurality of bolts **20** needed to secure the flange **21′** to the supporting frame **12—12′**.

In Fig. 3, I show a further modification applicable to a situation in which the isolation from shock is to be primarily along the axis of the elongated transducer **25**, as distinguished from the predominantly transverse isolation of Figs. 1 and 2. In the Fig. 3 situation, the supporting flange means may comprise a single flange **26** of yieldable material and formed as an annular skirt continuously joined to the outer periphery of the transducer **25**; again, I prefer that the outer periphery of the transducer **25** be defined by a boot of rubber-like material and that the flange means **26** be formed integrally therewith. To accommodate the mounting flange **26**, the frame support **27** may, at least at the location of flange

26, comprise a single rigid plate having an opening 28 in which the transducer 25 may be positioned with substantial radial clearance, as shown. As for the case of Fig. 1, the outer limit of the yieldable flange 26 preferably is bonded to an internal reinforcement means 29. The means 29 may be one of a plurality of washers for each location of a securing bolt 30, or it may be a single strip of metal extending substantially coextensive with the region of overlap, which in the case of Fig. 3 means a ring or annular reinforcement member 29, about the axis of the transducer.

Depending upon the length of the transducer 25, one or more of the described radial-plane type of flange will be necessary to provide the necessary support. In the form shown, I merely suggest provision of a plurality of such flanges by inclusion of the additional flange 31 at the lower end of the transducer, secured to another part 27' of the frame means.

It will be seen that I have described a relatively simple and highly effective shock mounting for elongated transducers. The mounting is particularly applicable to underwater transducers which are subjected to severe abuse and prolonged underwater exposure. The basic construction lends itself to provision of shock isolation, either predominantly along the axis of the transducer or predominantly transversely thereto, as dictated by operational requirements; even though isolation may appear predominantly in certain directions, the predominance is not great because all support for the transducer is derived through material having yieldable waterlike properties, insofar as sound and sonic frequencies are concerned. My construction is superior to previous clamp constructions for shipboard mounting, and substantial savings in hardware requirements are realized.

While I have described the invention in detail for the preferred forms shown, it will be understood that modifications may be made within the scope of the claims which follow.

I claim:

1. In combination, transducer means and mounting means integral therewith, said transducer means comprising an elongated structure electrically responsive to incident pressure fluctuations and including a peripherally continuous outer boot of pressure-transmitting material in intimate pressure-transmitting relation with said structure, said mounting means including flange means of yieldable material extending generally radially of the axis of said transducer means, a metal portion bonded within said flange essentially only in the region adjacent the outermost edge, and a frame support having an opening defined by an inner edge overlapping the outer part of said flange means, whereby a substantial part of the radial length of said flange may be unsupported and may therefore yieldably support said transducer, and anchoring bolts passing through the flange means and through said metal portion and engaging said frame support.

2. The combination of claim 1, in which said metal portion comprises an elongated strip substantially coextensive with the length of said flange means, there being a plurality of securing bolts passing through said strip and through said flange means at spaced locations along the length.

3. The combination of claim 1, in which said metal portion comprises at each bolted location a washer through which the bolt passes.

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