

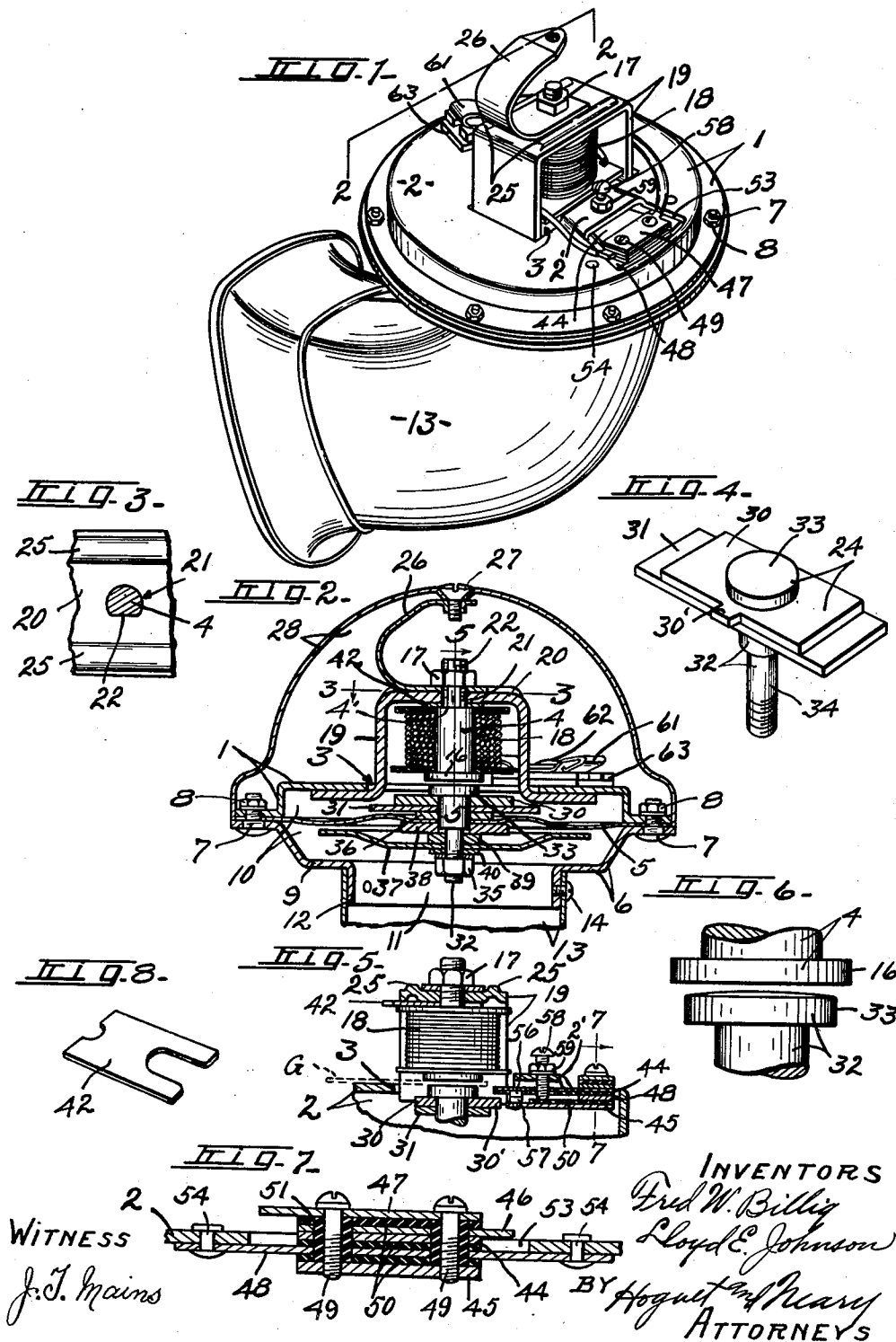
Sept. 14, 1937.

F. W. BILLIG ET AL

2,092,950

HORN

Filed July 31, 1934



UNITED STATES PATENT OFFICE

2,092,950

HORN

Fred William Billig and Lloyd Elmer Johnson,
Jackson, Mich., assignors to The Sparks-
Withington Company, Jackson, Mich., a cor-
poration of Ohio

Application July 31, 1934, Serial No. 737,746

2 Claims. (Cl. 177-7)

This invention relates to improvements in signaling devices commonly known as horns for power driven vehicles and which involve the use of a magnetically actuated diaphragm.

The main objects of this invention are to provide a sound signal or horn of the magnetically actuated diaphragm type, that is especially light, durable and economical in construction; that is long lived and reliable in operation; that may be readily assembled and permanently adjusted; and that, at the same time, has exceptionally fine tone qualities.

In carrying out the above mentioned objects, we have by improvements in the design, construction and arrangement of the various elements of our improved horn reduced the number of parts from about one hundred fifty-one employed in previously constructed horns of the same type to substantially forty-one, or a reduction of approximately seventy-three percent, while the weight of our novel horn is substantially twelve and one-half percent, less than that of similar types of conventionally constructed devices.

The specific manner in which the above mentioned improvements are obtained, as well as other objects and advantages pertaining to the size and form of the various parts of the structure, will more fully appear from the following description, taken in connection with the accompanying drawing, in which:

Figure 1 is a perspective view of a horn embodying the various features of this invention, illustrating the same with the motor cover removed;

Figure 2 is a transverse sectional view taken substantially on line 2-2, Figure 1, and illustrating the motor cover assembled in operative position;

Figure 3 is a detail horizontal sectional view taken on line 3-3, Figure 2;

Figure 4 is a perspective view of the armature assembly;

Figure 5 is a detail transverse sectional view taken substantially in the plane of the line 5-5, Figure 2;

Figure 6 is an enlarged detail side elevation of the adjacent coating end portions of the armature and field studs;

Figure 7 is an enlarged detail sectional view taken on line 7-7, Figure 5; and

Figure 8 is a perspective view of a shim used to adjust the magnet core relative to the armature.

The signaling device comprising this invention and as shown in the drawing, comprises a pressed

metal rear diaphragm housing section 1, having its central portion pressed laterally to form an integral substantially cylindrical cup-shaped member 2, said member being formed at its central portion with an opening 3, for the reception of an electro-magnet or a magnetic field presently described.

The diaphragm as 5 is clamped between the rear diaphragm housing 1 and a front diaphragm housing section 6, by bolts 7 extending through aligned holes provided in the marginal portion of the housing sections 1 and 6 and diaphragm 5, and nuts 8 which are screw threaded on the bolts 7. The bolts 7 are arranged in uniform circumferential spaced relation and the nuts 8 coact with the bolts for securely and rigidly clamping these members together. The front diaphragm housing section 6 has the central portion thereof pressed laterally to form an integral substantially cup-shaped member 9 arranged in opposed relation to the central portion 2 of the rear diaphragm housing section to form a diaphragm chamber 10, therebetween. The portion 9 of the front housing section is provided with a central opening 11 defined by an outwardly extending annular flange 12 which supports a projector 13 of any desired contour, and which may be removably secured to the flange 12 by any suitable means as screws 14.

The diaphragm 5 extends as shown in Figure 2 through the chamber 10 intermediate the front and rear walls thereof, and is preferably of serpentine formation in cross-section for the reason that the diaphragm when so formed may be made from thinner stock with the resulting saving in cost than when formed substantially flat, and further, when the diaphragm is so formed, it is found to have improved tone qualities.

The electro-magnet or magnetic field previously referred to is preferably of the form best illustrated in Figure 2, and comprises a core 4 of solid stud formation having an enlarged flange or head 16, at one end, while the opposite end portion of the core or field stud is reduced in diameter and externally threaded to receive a nut 17 thereon.

The field coil 18 is mounted on the stud 4 between head 16 and the threaded portion, and is built up of coiled wire in the well known manner, and is taped or otherwise insulated from the stud 4. The stud 4 and coil 18 are secured to the rear diaphragm housing section 1 by means of a U-shaped bracket or yoke 19 positioned at the rear of the rear diaphragm housing section 1. The legs of the yoke extend through the opening

3 of said section and have the outer end portions thereof extended outwardly from the remaining portion and positioned adjacent the inner or forward face of the housing section portion 2. The yoke 19 is permanently secured in position to the housing section 1, preferably by spot welding, so as to form a substantially solid unitary structure of maximum strength.

The central or transverse portion as 20 of the yoke, as hereinbefore hinted, is positioned at the outer or rear side of the rear diaphragm housing section 1 in considerable spaced relation thereto, and is provided with a central opening 21 for the reception of the reduced threaded portion of the stud 4. The hereinbefore mentioned nut 17 is screw threaded on the outer end of said threaded portion of the stud 4 and coacts with the shoulder as 4' formed by the reduced portion of the stud for securely clamping the stud to the yoke.

It is desirable, as will be more readily apparent farther on in the description, that the coil 18 and field stud 4 be maintained against rotary movement as the nut 17 is being threaded to the clamping position, and for this purpose the threaded portion of the field stud is provided with a flat surface as 22 along one side thereof, while the opening 21 is provided with a similarly flattened side adapted to cooperate with said flattened portion of the stud.

The yoke 19 is preferably, in order to obtain maximum strength with minimum weight, a metal stamping. Further, the yoke is formed from a solid piece of hot or cold rolled steel so as to provide a support connected directly to the field stud which has high permeability characteristics which reduces arcing between the contacts 56 and 57, presently described, and thus eliminate the necessity for a condenser across said contacts.

The yoke 19 has the transverse portion 20 thereof provided with a pair of outwardly extending ribs 25 positioned one adjacent either side thereof. These ribs 25 not only reinforce the yoke member, but also form guide stops adapted to maintain a cover attaching bracket 26 against rotation as the nut 17 is screw threaded to the clamping position. This bracket 26 is in this instance, a U-shaped slightly resilient member having one leg thereof mounted on the portion 20 of the yoke 19 intermediate the ribs 25 and is provided with an aperture adapted to receive the reduced threaded portion of the magnet stud 4, therethrough. The other end of the bracket terminates above the field stud 4 in spaced relation thereto and is provided with a threaded aperture arranged substantially coaxially with the field stud 4 for receiving a screw 27 which extends through a suitable opening provided at the center of a cover 28 for securing said cover in position for enclosing the rear diaphragm housing section 1, yoke 19, and the members carried thereby. This cover 28 is an inverted cup-shaped member having the marginal edge thereof flared outwardly for surrounding the marginal edge of the rear diaphragm housing section 1, and adapted to engage the marginal edge portion of the front diaphragm housing section 6 which, as shown in Figures 1 and 2, is slightly larger in diameter than that of the rear section 1 for the purpose of supporting the cover 28.

It will thus be seen that the cover 28 is maintained against lateral displacement on the front housing section 6 by the engagement therewith with the peripheral edge of the rear diaphragm

housing section 1, while said cover is secured in position by the single screw 27. Further, by forming the bracket 26 slightly resilient, it will be observed that when the screw 27 is threaded inwardly for tightly securing the cover in place, the strain which might otherwise be produced upon the field stud 4 and yoke 19, will be entirely absorbed by the bracket and thus prevent the adjustment of the horn from being disturbed and the elimination of any distortion of the horn which might otherwise be produced if a rigid connection was provided for securing the cover in place.

The hereinbefore mentioned armature 24 comprises, in this instance, a pair of substantially rectangular plates 30 and 31 secured together in superposed relation by spot welding, rivets, or the like. The inner plate as 30 is of slightly less length than the outer plate 31, and is adapted to extend rearwardly intermediate the legs of the yoke 19, while the other plate 31 extends outwardly at either end some distance beyond the plate 30 into overlying relation with the corresponding legs of the bracket 19, as clearly illustrated in Figures 2 and 4.

The plates 30 and 31 are provided with aligned central openings for the reception of the armature stud 32 which is provided at one end with an enlarged flange portion or head 33, while the other end as 34 of the stud is reduced in diameter and externally threaded for the reception of a nut 35. The armature plates 30 and 31 are secured to the diaphragm 5 by means of the armature stud 32 which extends through a suitable opening provided at the center of the diaphragm 5 in coaxial relation with the field stud 4. The plates 30 and 31 are maintained in spaced relation to the diaphragm 5 by means of a washer 36 mounted on the stud 32 intermediate the plate 31 and diaphragm 5. The forward or outer end of the stud 32 supports a resonator 37 which is maintained in spaced relation with the diaphragm 5 by a pair of washers 38 and 39. The plates 30, 31, stud 32, resonator 37, washers 35, 38 and 39, and the diaphragm 5 are rigidly and tightly secured together and to each other by means of the nut 35 and a lock washer 40 coacting with the head 33 of the stud 32. The head 33 is positioned adjacent the smaller armature plate 30 in close proximity to the head 16 of the field stud 4 for movement into and out of contact with said head 16 during the flexing of the diaphragm 5.

It will be observed that the stud 32, armature plates 30 and 31, diaphragm 5 and resonator 37 will be rigidly secured together by the nut 35 for unitary movement while the thickness of the washer 36 is such as to normally maintain the outer end surface of the head 33 in the plane of or slightly at the rear of the rear or outer surface of the central portion 2 of the rear diaphragm housing section 1. The length of the central portion of the field stud 4 relative to the yoke 19 is such as to maintain the head 16 of the stud 4 normally in slightly spaced relation with the head 33 of the armature stud 32 so that the head 33 of the armature stud will strike against the head 16 of the field stud when drawn toward the field stud upon energizing the field magnet by current flowing through the coil 18.

Further, the thickness of the head 33 and armature plate 30 are such that when the head 33 is in contact with the head 16, the armature plate 31 will almost, but not quite, contact with the adjacent portion of the legs of yoke 19.

It will thus be seen that inasmuch as the stud

4 and yoke 19 are connected together in direct contact with each other, that the yoke 19 will constitute a portion of the magnet or magnetic field and forms an iron shell partly surrounding and protecting the coil 18, and through which the magnet circuit is completed. Further, inas-

much as the armature plate 31 partly overlies the ends of the yoke 19, said armature plate will lie in the path of magnetic flux and be attracted toward said ends of the yoke, as said yoke becomes energized by the current passing through the coil 18, with the result that a maximum amount of magnetic force will be exerted upon the armature for a given current passing through the coil.

By referring to Figure 6, it will be observed that the contacting surface of the head 16 is formed substantially flat and normal to the axis of the stud 4, while the contacting surface of head 33 is slightly convex, so that there will always be a uniform surface contact of the stud members, even though the armature stud 32 may be moved or tilted out of axial alinement with the field stud 4, due to an uneven flexing of different portions of the diaphragm 5. This arrangement of the contacting surfaces of the heads 16 and 33 also insures a uniform predetermined vibratory movement of the diaphragm 5 and armature assembly 24.

It is very essential in this horn that the normal clearance between the armature stud 32 and field stud 4 be very slight, and this clearance is necessarily confined between very close limits to obtain the maximum efficiency and tone qualities of the horn. This clearance can be accurately obtained and permanently maintained in the present structure in a very easy and efficient manner, as follows:

The gap between the heads 16 and 33 is obtained by first inserting a thickness gauge corresponding in size to the required gap between the heads 16 and 33. This is readily accomplished as illustrated, by broken lines in Figure 5, by passing the gauge, when the cover 28 is removed, over the top or rear surface of the central portion 2 of housing 1, and between the legs of the yoke 19 until the end of the gauge rests upon the lower or forwardly positioned head 33, which, as previously stated, is in substantially the same plane as said surface of the housing section. The field stud 14 is then released by the screwing of the nut 17 outwardly and moved into engagement with the gauge G, after which a shim as 42, or possibly a plurality of shims, of required thickness for spacing the head 16 from the head 33 is inserted over the coil 18 and between the field stud shoulder 4' and the adjacent portion of the yoke 19. The stud 4 is then securely and rigidly clamped to the yoke by screw threading the nut tightly against the yoke or bracket 26.

As it usually requires the trying of shims of different thicknesses before obtaining the proper adjustment of the stud 4, it will now be readily understood that some means, as the flattened portion 22 of the stud 4, is necessary to maintain the stud and particularly the coil 18 mounted on said stud, from turning to prevent breaking or injuring the electrical connection between the coil and associated terminals as the nut 17 is screw threaded toward and from the clamping position.

An automatic circuit breaker as is usual in horns of this type is provided whereby the field coil 18 is caused to be energized intermittently. This circuit breaker provided herewith is of novel construction in that it is composed of a very

few simply constructed parts. Further, the circuit breaker is quickly and readily adjusted by the manipulation of but one member, whereas, the manipulation of two or more members is usually required in horns of this type as formerly constructed. As illustrated in Figures 1, 5 and 7, two contact plates 44 and 45, two terminal plates 46 and 47, and a supporting bar 48 are secured together by screws 49. The contact plates 44 and 45 and the supporting bar 48 are maintained in electrically insulated spaced relation with each other by means of insulating plates 50 and tubing 51 composed of any suitable insulating material. One of the contact plates as 44 and the terminal plate as 46 are mounted in contact with each other, while the contact plate 45 is maintained in electrical connection with the other terminal plate as 47 by the screws 49 which are screw threaded in the contact plate 45. This circuit breaker assembly is mounted in the diaphragm chamber 10, at one side of the armature plates 30 and 31, in operative relation with said armature plates with the outer ends of the contact plates 44 and 45 in registration with a substantially rectangular opening 53 provided in the portion 2 of the diaphragm housing section 1. The circuit breaker assembly is yieldingly supported in the diaphragm chamber 10 by the supporting bar 48 which is a relatively thin, slightly resilient member and extends transversely of the contact plates 44 and 45 with the ends thereof extending beyond the sides of said contact plates. The supporting bar has either end thereof permanently secured by a rivet 54, or its equivalent, to the housing section 1 at a respective side of the opening 53.

The contact plates extend radially inwardly from the supporting bar and have coacting contact members as 56 and 57 secured respectively therewith. The lower or forwardly positioned contact plate as 45 is a relatively short, thick inflexible member, while the other contact plate 44 is a relatively thin, flexible member, and extends inwardly beyond the contact plate 45 in a plane over or rearwardly of the armature plates 30 and 31. The inner end of the contact plate 44 terminates in the path of movement of a lug or projection as 30' secured to or made integral with the armature plate 30. The contact points 56 and 57 are normally maintained in contact with each other, but the flexible contact plate 44 is so positioned relative to the armature plates that when the armature assembly is drawn inwardly or rearwardly as the field coil is energized, the contact plate 44 will be engaged by the lug 30' and flexed upwardly or rearwardly thereby sufficiently to move the contact point 56 out of engagement with the contact point 57 to break the circuit passing therethrough.

To obtain the correct adjustment of the contact plate 44 relative to the armature plates 30 and 31, we have provided a screw member 58 which is screw threaded in that portion as 2' of the central portion 2 of the rear diaphragm housing section 1 which overlies the contact plates 44 and 45 and which, in this instance, is pressed outwardly or rearwardly slightly to receive the plate 44 and permit the free flexing thereof. The inner end of the screw 58 is maintained in electrical insulated relation with the contact plate 45 by the adjacent insulating member 50 which is extended inwardly over the contact plate as illustrated in Figure 5. The contact plates 44 and 45 are assembled on the supporting bar 48 in such a manner that the contact points 56 and

57 will normally remain in engagement with each other, while the contact plate 44 is normally maintained by the supporting bar 43 in considerable spaced relation with the armature plates, 5 so that, in order to bring the contact plate 44 into correct relation with the armature plate 30, it is only necessary to move the inner ends of the contact plates 44 and 45 outwardly or frontwardly towards the armature plates.

10 This movement of the plates is effected by screw threading the adjusting screw 58 inwardly, inasmuch as the inward movement of the contact plates is permitted by the flexing of the supporting bar 43, and the contact plates may be 15 maintained in the adjusted position by a lock nut 59 screw threaded on the adjusting screw 58.

The horn is also provided with a pair of terminal members as 61 which, in this instance, comprises a pair of spring members connected 20 to the rear housing section 1 in insulated spaced relation to each other and to said section by a rivet 62, or its equivalent, and insulating member 63. One of the terminal members 61 is connected in the usual manner with one end of the field 25 coil, while the other terminal member is connected with one of the terminal plates as 46, the other terminal plate 47 being electrically connected with the other end of the coil 18.

Although we have shown and described a specific structure, we do not wish to restrict ourselves to the details or form of said structure as various changes may be made within the scope of the appended claims.

We claim:

35 1. A sound signal comprising a sheet metal diaphragm housing section, a diaphragm mounted on one side of said section, an armature secured to said diaphragm, said section having a substantially central opening, an electro-magnet 40 mounted on the other side of said section in operative relation with said armature, said section having a second opening spaced laterally from the first named opening, the portion sep-

arating said openings being offset in a direction away from said diaphragm, a circuit breaker for intermittently breaking the circuit to said electro-magnet, support means for resiliently securing one end of said circuit breaker to said housing section within said second named opening, the 5 other end of said circuit breaker extending in underlying spaced relation with respect to said offset portion and into operative relation with said armature, and means supported by said offset 10 portion and engaging the circuit breaker for adjusting said circuit breaker relative to said armature.

2. In a warning signal of the class wherein a diaphragm housing section provided with a substantial central opening has a diaphragm connected therewith to extend across said opening at one side of the section, an electro-magnet including a core is mounted on the other side of said section with said core in co-axial relation 15 with said central opening, and wherein said diaphragm has an armature connected therewith in cooperative relation with said core, said signal being characterized by said housing section having a second opening spaced laterally from the 20 central opening and a circuit breaker comprising two contact plates for intermittently breaking the circuit to said electro-magnet, support means fixedly secured to said housing section at 25 two points disposed at opposite sides of said second opening, said support means being connected with the contact plates in insulated spaced relation thereto for securing said plates to said housing section within said second named opening, one of said contact plates being a relatively 30 flexible member and extended into operative relation with said armature, and means supported by the housing section and engaging the other contact plate for adjusting said circuit breaker 35 relative to the armature. 40

FRED WILLIAM BILLIG.
LLOYD ELMER JOHNSON.