Jan. 25, 1944. H. D. ELLSWORTH 2,340,213

IMPULSE TRAFFIC REGISTER

Filed Nov. 29, 1939 2 Sheets-Sheet 1

Fig. 1.

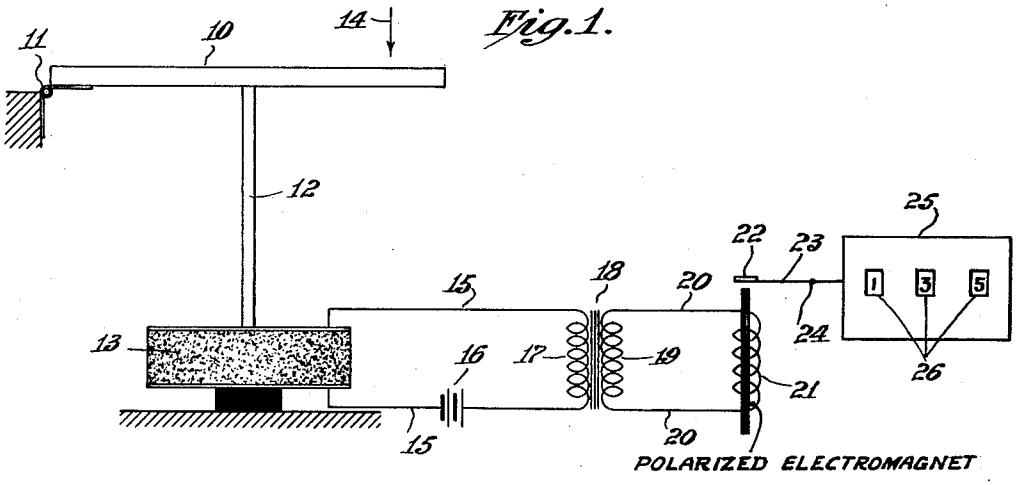


Fig. 2.

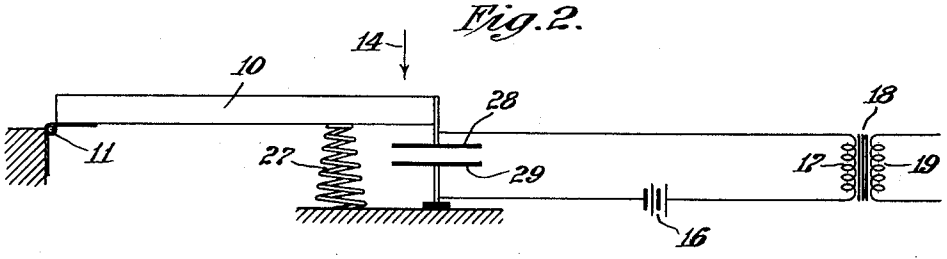
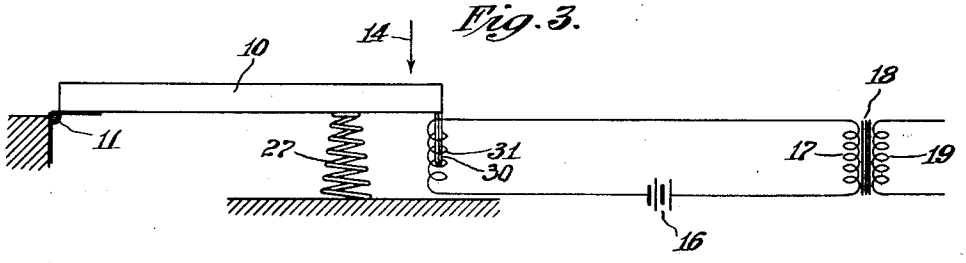


Fig. 3.



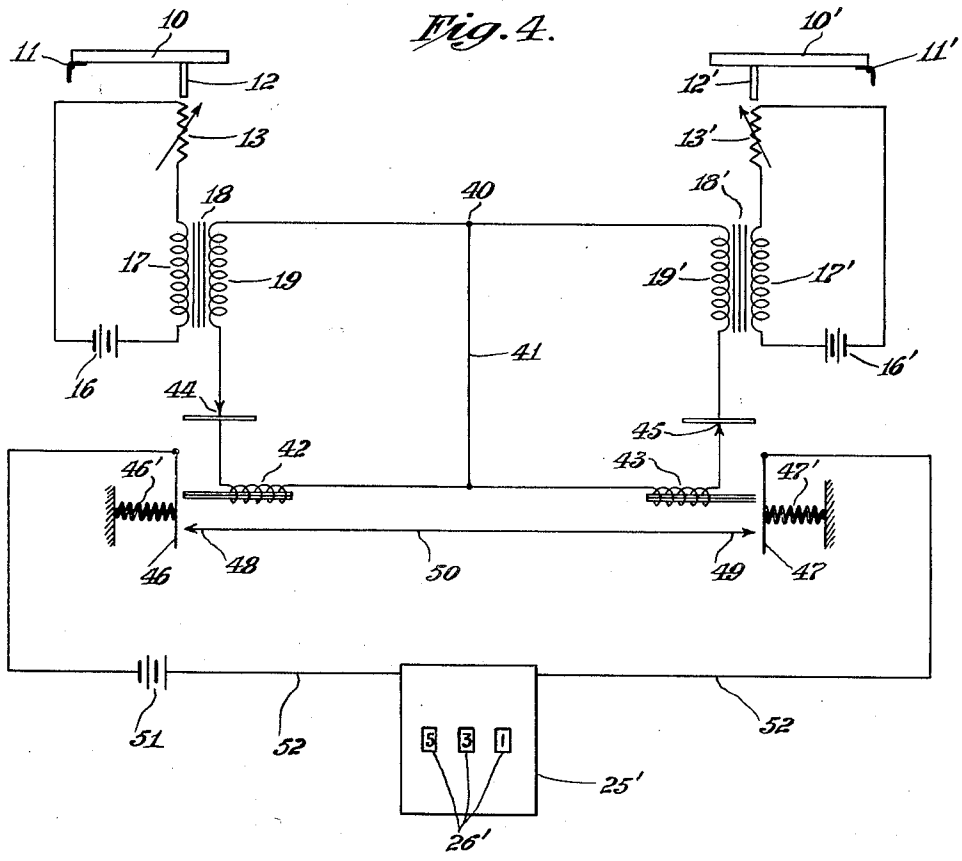
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Filed Nov. 29, 1939 2 Sheets-Sheet 2

Fig. 4.



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Patented Jan. 25, 1944 2,340,213

UNITED STATES PATENT OFFICE

2,340,213

IMPULSE TRAFFIC REGISTER

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Application November 29, 1939, Serial No. 306,599

8 Claims. (Cl. 175—335)

The present device relates to apparatus and methods for exhibiting the passage of discrete bodies over a given point. More particularly, it permits the exhibition, and thereby the counting, of objects of irregular size and of varying weight, such as persons, who are passing a given spot.

One object of this invention is to provide means for exhibiting persons who are entering or leaving a given place, such as a theatre.

Another object of the present invention is to provide relatively simple and cheap means for exhibiting pedestrian traffic, especially traffic which is directed into a relatively narrow channel or passageway, without the use of optical devices such as photo-electric cells, which are delicate, expensive, and which are subject to error when the persons passing therebefore are not in a single line, with intervals between each person and the next one.

A further object of my invention is to provide a device which will provide a very great degree of accuracy in exhibiting persons who are walking almost abreast, or in other relative positions where the exhibiting devices of optical nature, above referred to, would fail to distinguish between persons thus relatively disposed.

Yet another object of my invention is to provide means for exhibiting the number of persons entering a theatre or the like, through a given passageway, such means being relatively simple and inexpensive, and yet possessing a degree of accuracy sufficient for commercial purposes, which do not demand extreme mathematical accuracy.

Another purpose of this invention is to prevent collusion between ticket sellers and ticket takers, at such places as theatres, by providing apparatus which is inconspicuous and the presence of which may be unknown to the employees or patrons of such theatres, which apparatus will exhibit, to a very great degree of accuracy, the actual number of persons who have entered and/or left the theatre.

A further purpose of my invention is to provide an exhibiting device, of the nature just described, which shall be virtually invisible to the persons exhibiting thereupon, shall not impede traffic and shall not require traffic to maintain an absolute single file.

Another object of this invention is to provide exhibiting apparatus, which may easily be installed in existing structures, without demanding extensive and expensive alterations of such structures.

Yet a further object of my invention is to provide exhibiting apparatus, which may give a permanent exhibit of pedestrian traffic at a remote point, without the need of intermediary apparatus other than a few small, inexpensive and easily concealed electric wires between the point of passenger traffic and the point of exhibition thereof.

Still another object of one form of my invention is to provide means whereby the retrograde passage of persons, over a given point, will not only fail to give false exhibitions, corresponding to a normal forward passage thereover, but may also give separate types of exhibition for such retrograde passage.

For example, such means may either fail entirely to respond to such retrograde passage, may exhibit, such retrograde passages upon a separate exhibit, or may automatically subtract such retrograde passages from the sum total of normal forward passages, whereby a true exhibition of only the total number of persons who have completed a forward passage over this point will be exhibited, or optionally, an exhibit of the net number of persons passing over such point, and not returning thereover, may be secured.

In the exhibiting of traffic, it often happens that a person will enter into a spatial relationship with the exhibiting apparatus sufficiently close to determine the exhibition of the person, and then will withdraw, instead of completing his passage through the exhibiting apparatus. This will give rise to a false exhibition of the total number of persons who have entered a theatre, for example, when the devices of the prior art are employed, and one object of my invention is to provide apparatus which will give only a complete exhibition when a passage is completely made in the normal direction of traffic flow, thereby affording a true exhibition of the actual net traffic through such apparatus.

My invention may broadly be described as a method of exhibiting traffic by causing such traffic to rest sequentially upon two areas, in such fashion that each person must first enter upon one area and then must, of necessity, step off this first area and upon a second area in order to complete a passage through the device. As one example of such an arrangement, two platforms may be located so that they occupy the entire width of a passageway through which the traffic goes, but which platforms are located sequentially relative to the traffic flow.

I then provide, connected to each such platform, means which will transduce any increment or decrement of pressure upon the respective plat-

form, into an electrical impulse. These electrical impulses are then caused to actuate exhibiting devices according to their character and sequence, as hereinafter described.

It is especially to be noted that I do not employ transducing means which are operative in response to static pressures upon such platforms as described, but that I use a transducer system which will respond only to increments or decrements of pressure or to movements arising therefrom. While I may arrange certain minimum limits below which, changes of pressure will be ineffective, if so desired, for example, in order that the passage of very small children over my device shall not be exhibited, yet the factors utilized are, in general, qualitative in nature.

For example I do not necessarily depend upon any quantitative factors, strictly termed, involved in the movements or pressures utilized for transducing purposes, but broadly speaking, only upon qualitative factors, such as whether a dynamic change is positive or negative in character, and the relative sequence of such changes, as traffic moves sequentially over the two platforms. In this fashion, I can exhibit all persons above any desired minimum weight as of equal value, which corresponds with the practice usually employed in selling admission tickets to theatres and the like. However, my apparatus can easily be adjusted to respond to quantitative factors involving dynamic elements, if so desired.

Referring now to the drawings hereunto annexed:

Fig. 1 represents, partly schematically, a single platform with transducing apparatus utilizing a variable resistance connected to the exhibiting apparatus.

Fig. 2 illustrates a platform and a portion of transducing apparatus using a variable capacity.

Fig. 3 shows a platform and a portion of a transducer using a variable inductance or a reciprocating magneto-generator.

Fig. 4 illustrates schematically a complete circuit using two platforms, two transducers and selective means for determining the exhibition only for a given character and sequence of pressure impulses upon the two respective platforms.

In Fig. 1, I have shown platform 10, pivoted at point 11, by any suitable means and connected by a rod 12 to a microphone 13. A person stepping upon platform 10 will cause a downward pressure, as indicated by the arrow 14, and this pressure will be communicated by element 12 to microphone 13. Wires 15 connect this microphone in series with battery 16 and primary winding 17 of transformer 18, whose secondary winding 19 is connected by wires 20 with a polarized electro-magnet 21. Suspended in proximity to the core of magnet 21 is armature 22, mounted upon arm 23, which is movable around pivot 24. Arm 23 is shown as entering a reciprocating exhibiting device 23, of any suitable type and provided with exhibiting dials 26.

Platform 10 may be supported in any other manner than by the pivot, provided that it is free to move to a limited extent in a vertical direction, and its motion may be communicated to microphone 13 by any suitable means. For example, the microphone may be in direct contact with the platform, or pneumatic or hydraulic transmission means may be used to convey and to decrease or to increase the extent of such motion available for actuating the microphone, as by the use of a lever having arms of unequal length, or by using a device of the type employing a liquid acting upon pistons of unequal area.

Likewise any other suitable type of quick acting compression type rheostat may be used in lieu of the microphone here shown, but I prefer that such transducing device of the variable resistance type be selected and disposed so as to require a motion of extremely small amplitude for its operation, so that the movement of the platform will be inappreciable to a person stepping thereupon. Battey 16 and transformer 18 may be of any suitable type, chosen to accord with the characteristics of the electro-magnet on the output side, as well known in the art, and with those of the microphone on the input side.

The electromagnet 21 will, upon suitable energization, attract the armature 22 and thus cause a movement of the arm 23; impulse exhibiting devices of the reciprocating type are well-known, and it is thought unnecessary to here illustrate details of the internal mechanism thereof. Each movement of an actuating arm of such an exhibiting device will cause the actuation of a train of gears therewithin, and cause the total exhibited upon dials 26 to be advanced by one unit for each such movement.

While there will be a continuous flow of current from battery 16 through the microphone and primary 17 of the transformer, yet the latter device will function as a filter so that no current will appear in the secondary winding of the transformer, as long as the microphone does not alter its resistance.

Thus, my device operates to distinguish static from dynamic impulses or pressures upon platform 10, for any alteration of pressure upon the platform will give rise to a current impulse which will induce a corresponding current impulse in the secondary winding 19 of the transformer.

An increment of pressure upon the platform will cause a current increase in the primary circuit of the transformer, and therefore will cause a secondary current which flows in one certain direction only. On the other hand, a decrement of pressure will cause a reduction of primary current, and a secondary current flowing in the opposite direction, as well-known in the electrical art. Electro-magnet 21 is of the polarized type, so that it will respond only to current flowing in a predetermined direction. In this fashion, my device operates to distinguish between pressure increments and pressure decrements, by virtue of the action of this electro-magnet. Of course, if the mechanical output of the virtual relay constituted by electro-magnet 21, armature 22 and arm 23 is inadequate, amplifying apparatus either of the electromagnetic or of the electronic tube relay type may be employed to determine the final actuation of the exhibitor 25.

In some cases a simple single platform arrangement of the type just described may be satisfactory for exhibiting purposes, as it can be adjusted so that a certain minimum value of increment or decrement of pressure is needed in order to actuate relay assembly 21, 22, 23. Such adjustment may be made by variations in the characteristics of the microphone, the value of the battery energy output, the sensitivity of the relay assembly, or by other means which will be apparent to those skilled in the art. As a person steps upon the platform, the apparatus may be so arranged that the direction of the current impulse, i. e. the current increment, will be in the proper direction so as to actuate the exhibiting device mechanism, in which case the current decrement caused by

the person stepping off the platform will not cause any further exhibition upon the counter mechanism, because of the selective action of the relay assembly with respect to the direction of the current flow. If so desired, the relay may be so connected as to respond to the current pulses caused by a person stepping off the platform, but in either case, there will be only a single exhibition for a single complete passage over platform.

In Fig. 2 I have illustrated the platform as supported in part by a spring 27 so that normally it will remain in the position shown, when no weight is resting thereupon. To a portion of the platform which is preferably distant from the pivotal point 11, there is affixed a condenser plate 28, adjacent to another condenser plate 29, which latter plate is solidly supported by any suitable means so as to remain fixed, irrespective of movements of the platform.

Any movement of the platform will then cause an alteration of the capacity between the two condenser plates, and consequently this alteration will give rise to a pulse of current from the battery 16. While I have here shown transformer 18 as included in the transducing circuit, it is possible with this form of my invention to omit this transformer, since the necessary discriminatory action of the device to distinguish between static and dynamic pressure conditions, will be determined by the fact that steady current flow cannot exist through the condenser formed by these two plates. Of course a suitable dielectric may be used between the condenser plates, in order to enhance the capacity thereof, as known in the art. Likewise amplifying means may be used if desired.

Apparatus which employs a variable capacity as part of an oscillatory circuit and detects frequency changes in such circuit by heterodyne or other means is well known in the measuring art, and is considered to be a species of amplifying means, so that detailed description thereof is not necessary. By employing such ultra-sensitive amplifying means, and by employing a solid dielectric of high specific inductive capacity between the condenser plates, I may obtain response for such movements of the platform as may be extremely minute.

In Fig. 3 I have illustrated a platform supported as in the form of Fig. 2, but bearing upon its outer end an iron core 30, which is movable within an electrical coil or winding 31, the latter being connected in series with the battery and the transformer primary. If core 30 be made of soft iron, its movement within the coil will vary the impedance thereof and thus positive or negative current surges will be set up in the primary transformer circuit as described in connection with the previous forms.

Many alternative constructions are possible with the forms of my invention above described. For example in lieu of the polarized electro-magnet or relay, there may be used a relay of the ordinary type, and a rectifier of any suitable type, such as the copper-oxid disc type, may be placed in series with the electro-magnet, so that the latter will respond only to current impulses in one direction. Of course the simple single platform type of my invention above described is open to the objection that a person may step upon the platform and then may step off again in a retrograde direction, in which case he will falsely be exhibited as having passed over the exhibiting spot.

Likewise a person passing wholly in a retrograde direction will also give a similar false exhibition. If a second platform be arranged so that a person passes over both platforms sequentially, and if each platform be arranged to exhibit separately, then such false impulses on one platform only may be detected. Likewise both platforms may be arranged to actuate a single exhibiting device which requires two impulses, one from each platform, in order to give a single complete exhibition. However even this latter expedient will not show retrograde passage, without the use of extremely complex electrical apparatus and circuits, and the possibility of several persons entering upon the first platform before any one of them enters upon the second platform raises still further difficulties with such an arrangement.

In Fig. 4 I have shown another schematically viewed form of my invention, using two platforms, which form is substantially free from the objections just mentioned. The principle upon which this form of my invention operates, is that it affords an exhibition, not by any single increment or decrement of pressure upon either platform singly, but is so arranged that it will exhibit only when there is a practically simultaneous decrement of pressure on the first platform and increment of pressure upon the second platform.

If the two platforms are arranged so close to one another that any person stepping off the first platform, must necessarily step directly upon the second platform, then it can be seen that only at the instant that such person is actually stepping from the first to the second platform, can the device exhibit. Thus mixed motion partly retrograde cannot exhibit, nor can wholly retrograde motion, since the current surges in the latter case will be exactly wrong in direction in both platform circuits.

In Fig. 4, the two platforms 10 and 10' are schematically indicated as actuating two variable resistances 13 and 13' in series with batteries 16 and 16' and primaries 17 and 17' of transformers 18 and 18' respectively. The secondaries 19 and 19' of the two transformers are joined together at point 40, and conductor 41 leads therefrom, to one end of the windings of each of two relays 42 and 43. Between the other end of each secondary winding and its respective relay are interposed rectifiers 44 and 45, respectively.

Alternatively to the use of these rectifiers, the relays 42 and 43 may be made of the polarized type, as above explained in connection with the description of the previous figures, since these two expedients are equivalent means for discriminating between current impulses of opposite character.

Relays 42 and 43 are each provided with respective armatures 46 and 47, normally held away from the electro-magnets and so the circuit will be open, by any suitable means such as springs 46' and 47', the stationary contacts 48 and 49 of the two relays are joined by a conductor 50, so that the two make and break points are connected in series with one another. In series with these points is battery 51, and wires 52 lead from the series circuit to exhibiting device 25', which is here shown of the type which is actuated directly by an electrical impulse, through electro-magnetic internal means well known in the art, since no relay having current selective action is required at this point, in this form of my invention.

Rectifiers 44 and 45 are arranged in the opposite sense, so that current can pass to relay 42 only when there is a pressure decrement on platform 10, and relay 43 can be actuated only by a pressure increment upon platform 10'. This corresponds to a person stepping from the first to the second platform, which passage will cause both relays to close simultaneously and thus cause a single actuation of exhibiting device 25. A current impulse on only one relay will fail to exhibit, since the other relay contacts will be open at this moment, thus leaving an incomplete circuit. Likewise a passage in a retrograde direction will set up current impulses which both rectifiers will oppose, so that no relay closure and consequently no exhibition occurs.

However it is possible to connected to each platform a circuit including a rectifier connected in the opposite sense to the one used to detect forward motion. Retrograde motion will then exhibit through such reversely connected circuits and may be exhibited upon a separate exhibiting device or may be made to actuate the same exhibiting device in a reverse direction so as to subtract and thus to give an indication corresponding to the net number of persons passing over the platforms and not returning thereover.

To accomplish this result, the circuit of Fig. 4 is used and a duplicate assembly of the elements including secondary windings 19 and 19' and the rectifiers and relays connected thereto, is provided. Such duplicate assembly has the secondary windings upon the same cores as windings 18 and 18', but wound in the opposite direction. The output circuit controlled by the duplicate relays may actuate a separate duplicate exhibiting device or may actuate a reverse motion mechanism of the exhibiting device 25' shown in Fig. 4.

As the increment and decrement upon the two pads may not be precisely simultaneous in every instance, it may be desirable to make relays 42 and 43 sluggish in response, or at least to be of the slow opening type. Such devices are very well known in the art of electrical communication, and either electrical or mechanical means, or both, may be used to impart this property to the relays.

Many variations and combinations of the different embodiments of my invention herein described will be apparent to those skilled in the art. For example, the transducers of Figs. 2 and 3 may be used in the form of my invention shown in Fig. 4, in lieu of the variable resistance type therein indicated. Instead of directly actuating the transducers of any of the types shown, there may be used a platform in the form of a chamber or pad filled with a substantially incompressible liquid, and a small pipe line may be led from such chamber to the transducer, where the principle of the hydrostatic press may be used to increase either the pressure or the amplitude component of the pressure surge, as may be desired in the case of a particular transducer. Alternatively, a microphone of suitable type may be directly immersed within a liquid filled pad.

While I have described my invention as applied to exhibiting persons, yet it is equally applicable to exhibiting the passage of other bodies, such as automobiles, pieces of manufactured goods, and to other like cases where bodies are in motion in a single direction. Likewise since my exhibiting device, in the embodiment shown in Fig. 4, is actuated only at the moment when a pressure transfer between the two platforms occurs, my invention additionally may serve to exhibit the exact moment when a body passes a given point.

In the form of my invention shown in Fig. 4, I may use mechanical means to slow down the movements of the two respective platforms, as by the use of well known retarding devices such as used in door checks and the like. Such slowing down of the movements of the platforms will tend to ensure that the two relays will be closed simultaneously for an interval sufficiently long to cause the operation of the exhibiting device proper.

While I have shown and described certain embodiments of my invention, yet many variations thereof will be apparent to those skilled in the art, and accordingly I do not limit the scope of this invention, except as set forth in the hereunto appended claims.

I claim:

1. A traffic exhibiting device including mechano-electric transducer means responsive to a change of pressure thereupon so as to alter at least one electrical constant of said transducer means, a source of constant electrical energy connected to said transducer means, and a device discriminatory as to current direction connected to said transducer means and responsive to a change of said electrical constant in one direction but non-responsive to a change in the other direction, said exhibiting device also including, connected between said transducer means and said discriminatory device, means for transforming changes in the intensity of flow of constant energy into changes in the direction of flow of current reaching said discriminatory device.

2. A traffic exhibiting device including a platform capable of being depressed by the passage of traffic thereover, a variable resistor actuated by said platform, a source of constant electrical energy in series with said resistor, a filter transformer capable of passing the variable current caused by the actuation of said resistor, but suppressing the constant current from said source, and having its primary input circuit connected in series with said source and said resistor, and an electro-mechanical transducer connected to the secondary output circuit of said filter transformer and actuated thereby.

3. A traffic exhibiting device including in combination a battery, the primary winding of a transformer, and a variable condenser, all connected in series with one another, mechanical means actuated by the pressure of traffic thereupon so as to change the capacity of said condenser, and a transducer discriminatory to current direction and connecetd to the secondary of said transformer.

4. A traffic exhibiting device including in series a source of constant potential, a variable condenser and a polarized electromagnet, and means responsive to the pressure of traffic passing over said register for varying the capacity to said condenser.

5. A traffic exhibiting device including two movable platforms located adjacent to each other so that traffic may pass from the first to the second platform, two mechano-electric transducers, each mechanically coupled to a single platform and responsive to the movement thereof, a source of constant electrical energy connected to each transducer, a filter transformer having a primary connected in series to each transducer and source

of energy and suppressing the steady state electrical output thereof, while passing from the secondary the variable electrical output thereof, a polarized relay of the normally open circuit type connected to the secondary output of each filter transformer and polarized in mutually reverse directions, a single series circuit including the output contacts of both relays, a source of electrical energy and an electro-mechanical transducer, whereby substantially simultaneous motion in opposite directions of said two platforms will close both said relays and actuate said electro-mechanical transducer.

6. A device for registering the passage of intermittent traffic including a platform reciprocated by the pressure charges caused by passage of said traffic thereover, an inductance device having relative motion between the core and the winding thereof, means coupling said platform to said inductance so that reciprocation of the platform will cause said relative motion of the above-recited parts of the inductance device, a battery and the primary winding of a transformer in series with said inductance device and a polarized electromagnet and the secondary winding of said transformer in series with one another.

7. A traffic exhibiting device responsive solely to intermittent traffic flow in a predetermined direction, including two adjacent platforms so disposed that traffic passes from the first platform to the second platform, a variable resistor actuated by each platform, a source of steady current connected to each resistor, a transformer primary winding in series with each current source and its respective resistor, a transformer secondary winding coupled to each primary winding, a current rectifier and open-circuit relay winding in series with each secondary winding, an electro-mechanical transducer and a source of electrical energy in a single series circuit also including connected serially therein the output contacts of both said relays, whereby said transducer is actuated only when both relays are simultaneously closed, said rectifiers being oppositely poled so as to respond to an increment of pressure upon one platform and a decrement of pressure upon the other platform, respectively.

8. A traffic exhibiting device including two mechano-electric transducive systems according to claim 1, the first responsive to traffic making mechanical contact therewith so as to give a current impulse in one direction only and the second responsive to traffic breaking mechanical contact therewith so as to give a current impulse in the opposite direction only, two normally open-circuit relays, each in series with the output of a single transducive system, and a single series connected circuit embracing the output contacts of both relays, a source of electrical energy and an electro-mechanical transducer, so that said series connected circuit is completed only upon the closure of both relays so as to operate said electro-mechanical transducer, said closure taking place substantially simultaneously in both relays, and whereby traffic passage in one direction only will yield current impulses in responsive directions in said electric transducive systems so as to determine the operation of the electro-mechanical transducer, while traffic passage in the opposite direction will fail to operate said electro-mechanical transducer.

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