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STATISTICAL MACHINE

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Fig. 1.

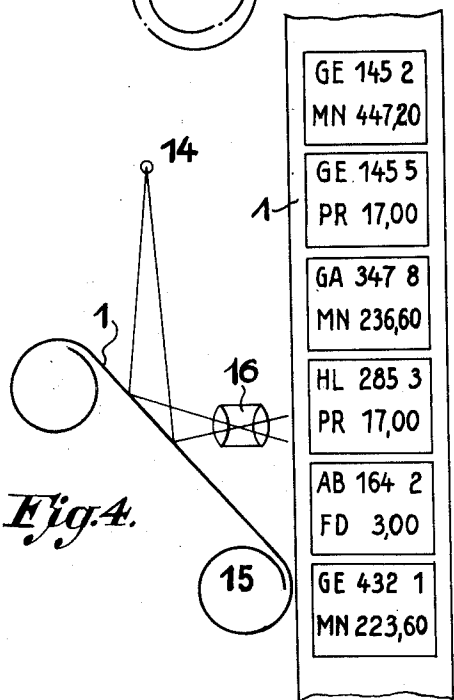
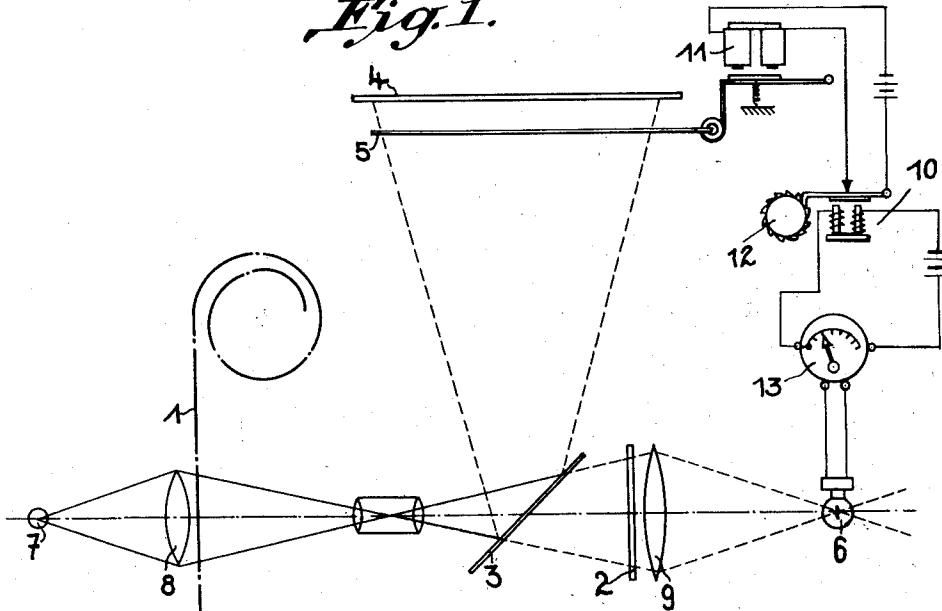


Fig. 2.

Fig. 3.



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STATISTICAL MACHINE

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This invention relates to a method of and means for controlling statistical machines, and its object is to provide a method and means in which counting devices, for example, may be controlled in action by radiating energy such as rays from a selenium cell, so that simplicity and rapidity of action may be secured.

In the accompanying drawings,—

10 Fig. 1 is a diagrammatic elevation of a statistical apparatus embodying my invention.

Fig. 2 is a view of a controlling transparency.

Fig. 3 is a view of a search plate.

15 Figure 4 illustrates a detail part of the apparatus of somewhat modified form.

It is well known to put in connection cards, strips etc. provided with record marks, perforations etc. with elements closing an electrical circuit so that the current is closed by the perforation and a counter set working. The influencing of these counters was done by mechanic or electric elements actuating across the perforations. The machines were very complicated and their speed rather limited owing to the inertia inherent to every mechanical element.

It is possible to transmit radiating energy through the perforations or other recording marks with which the cards, strips or bands are provided and thus to influence the counters.

This idea can be realized in various ways. A perforated card can be put in front of a series of selenium cells, light-electric cells, thermo-electric piles or bolometres (called hereafter "radiation-indicators"). Only the instruments receiving the rays of radiating energy through a perforation will be influenced, all others remaining immobile. A spot translucent for the kind of radiation in question can be used of course in place of the perforation. This is a particularly great advantage for the process, as thereby the perforated plates can now be substituted by plates made by photography.

This development of the process is of great importance if a combination of different statistical records is desired. In place of the perforations a positive photographic trans-

parency 1 provided with black letters, words, figures or other recording marks can then be used, further a negative 2 of a certain combination of figures or words (called hereafter "search-plate") is made. If the transparency containing the various statistical indications is now run through the machine in such a manner that the negative coincides with the transparency a complete coincidence impenetrable to any light or heat radiation will only be possible in one defined case; this will only occur when the negative bears exactly the same characters, marks, figures etc. as the transparency in question, the only difference being that in the negative these records are light on dark ground, while in the transparency they are dark on light ground. A certain combination has thus been picked out of a large number of others with extraordinary speed and reliability hitherto not obtainable. In order to obtain the coincidence of the negative with the transparency they can either be brought into contact (direct superposition) or be projected one upon the other (optical superposition); the latter method being more advantageous as the mechanical features of the machine are simplified.

Any instrument sensitive to the radiating energy can be used. In addition to the above stated devices the human eye can frequently be used wherever simplification of the apparatus is more important than speed. While the thermo-pile and far more the photo-electric cell are capable of following the fluctuations of the radiating energy with extraordinary speed, the limit of speed with which the human eye can perceive such fluctuations and transmit them to a recording mechanism or counter is about 5 times per second. When the eye is used as an indicator the apparatus is greatly simplified. In the example described above the eye sees immediately whether a complete darkening of the field of vision is obtained or not. In the first instance only a knob connected with a counting device needs to be pressed to ascertain that the combination exists.

A further advantage in the application of the radiating energy as recording device for

statistical machines lies in the fact that not only the existence of the radiating energy, but also its intensity or wave-length can serve to distinguish the various kinds of records. In the above mentioned example the negative can show, instead of translucent signs, such of different density or colour. It is then possible to immediately deduce from the strength of the reaction the kind of record mark. When certain kinds of statistical indications f. i. the sex of work people, are recorded in a red or green colour, the eye will immediately detect the respective category. A thermopile or a bolometre would in this case act with various deflections of the indicating galvanometre corresponding to the colour or intensity of the radiating energy and further record the statistical indications according to size or number.

Another feature of the above stated invention is the fact that the instrument indicating the existence of a certain statistical combination serves to simultaneously record the statistical indications connected with the combination. The light falling through the transparency can for instance be divided into two parts by means of a half-silvered mirror 3. One part falls on the negative containing the combination desired (search-plate), and the other on a sensitive photographic plate 4 protected by a shutter 5, which is mechanically or electrically connected with the photo-electric cell 6. Thus the access of light to the photographic plate is possible when the radiation indicator records the existence of the combination desired or looked for. By this method certain defined cases out of a large number of statistical indications are picked out and recorded on the photographic plate.

An example will illustrate the process. The turnover of a commercial undertaking is to be recorded statistically. The markets are to be indicated by different letters, the names of the various clients by three figures, the quantity of machine by figures, the kind of the machines sold by two letters and the amount of money by figures. By means of a special typewriter the various indications are arranged on lines closely one beneath the other and photographed on a film band as follows:

GE	145	2	MN	447,20
GE	145	5	PR	17,00
GA	347	8	MN	236,60
HL	285	3	PR	17,00
AB	164	2	FD	3,00
GE	432	1	MN	223,60

The question to be answered is for instance: how many machines of type MN have been exported to the country named GE? A negative (search-plate) bearing the letters "GE — MN —" is then inserted in the machine and the film band showing the statistical indications is run through. On

the first and sixth line of the above example the negative will coincide with the film band in such a way that no light can penetrate. The pointer of the indicating instrument 13 (for instance: galvanometer) will return on the first and sixth indication to zero thus switching on a current by a relay 10 and actuating a counter 12. Simultaneously a photographic exposure of the corresponding statistical indication is made showing the combination looked for. Thus the number of the sales in question is first recorded and simultaneously (which is still more important) all those sales corresponding to a certain combination are picked out of the multitude of the others and registered photographically one beneath the other. All the indications bearing the combination desired mentioning the customer, the price etc. appear complete on the photographic plate viz:

GE	145	2	MN	447,20
GE	432	1	MN	223,60

while all other items not corresponding to this particular combination are eliminated. As the indications can be photographed on a very small scale by means of modern photographic methods, the cost is very small.

The movement of the photographic plate between the various exposures can be done automatically.

Instead of perforating the statistical cards or strips, marks in different colours can be printed on these cards, since the radiating energy can act not only by passing through a medium but by way of reflection also.

The projection of the statistical record 1 on the search-plate 2 can be done by the light-source 7 and the condenser 8 as usual. The condenser 9 concentrates then the remaining light on the photo-electric cell 6. The relay 10 intensifies the current of the photo-electric cell 6 and brings the magnet 11 to action opening or closing the shutter 5.

I claim:

1. A process of carrying out adding, sorting, statistical and like operations which consists in exploring indications upon a search element comprising a search plate and a record element comprising a record card or strip and causing the radiating energy to actuate a recorder when the explored indications upon the search plate and record element are identical, the indications on one of said elements being penetrable by the rays and the indications on the other element being impenetrable by the rays.

2. A process for carrying out statistical and like operations characterized by exploring a record bearing statistical indications by means of light and causing the light to radiate as means for selecting certain records, and causing the light to impinge upon a sensitive photographic surface upon the statistical indications being of predetermined character.

3. A process for carrying out statistical

and like operations characterized by exploring a record bearing statistical indications by means of light and causing the light to radiate as means for selecting certain records, said statistical indications being of a different permeability to light than the remainder of the record.

4. A process of carrying out adding, sorting, statistical and like operations which consists in exploring indications upon a search element comprising a search plate and a record element comprising a record card or strip and causing one part of the radiating energy to influence a recording means and a second part of said radiating energy to influence an element sensitive to the radiating energy.

5. A process for carrying out adding, sorting, statistical and like operations which consists in exploring indications upon a search element comprising a search plate and a record element comprising a record card or strip and causing one part of the radiating energy to influence a sensitive photographic surface and a second part of said radiating energy to influence an element sensitive to the radiating energy.

6. A process for carrying out statistical and like operations characterized by exploring a record by means of light rays and causing said rays to influence photo-sensitive means upon the record being of predetermined character.

7. A process for carrying out statistical and like operations characterized by exploring a record bearing statistical indications by means of light and causing the light to radiate as means for selecting certain records.

8. A process of carrying out adding, sorting, statistical and like operations which consists in exploring indications upon a search element comprising a search plate and a record element comprising a record card or strip and causing the radiating energy to actuate a recorder when the explored indications upon the search plate and record element are identical.

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