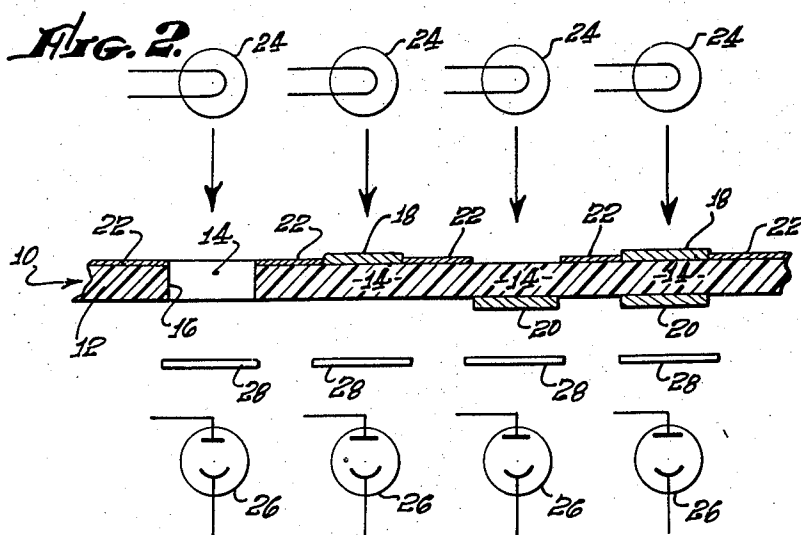
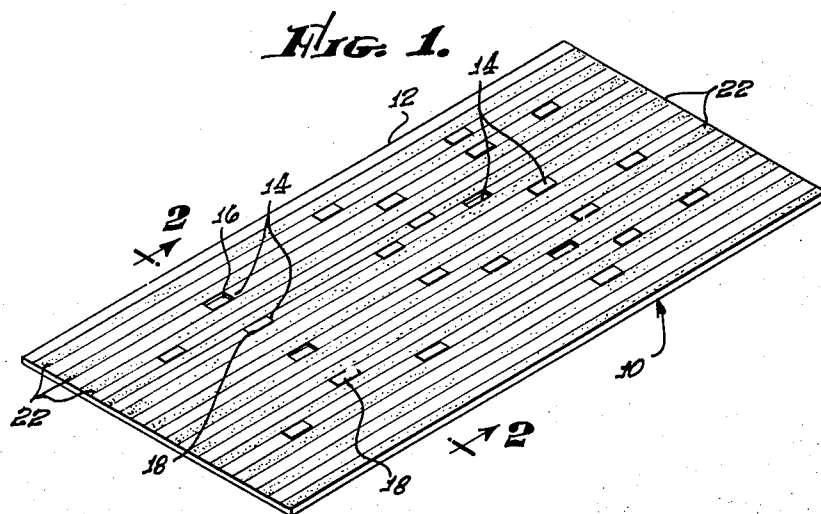


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TABULATING CONSTRUCTIONS

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TABULATING CONSTRUCTIONS

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This invention relates to new and improved tabulating constructions, and more specifically to the construction of new and improved tabulating cards.

The term "tabulating card" is commonly used at the present time to designate cards formed of paper or various synthetic compositions which are adapted to contain various "bits" of information in a coded form. These cards are commonly used with various types of tabulating equipment for a number of information storage and computing purposes. Practically all of the tabulating cards used at the present time are formed so as to contain various predetermined areas or sections which are adapted to be punched with various conventional types of equipment. The holes punched in these cards are adapted to be detected by either mechanical fingers, electrical sensing means, or by photo electric devices in conventional types of tabulating equipment. Photo electric scanning of tabulating cards is being used in newer machines at the present time because of the speed at which such equipment for photo electric scanning may be operated.

In the past a number of different types of photo electric scanning devices have been developed. Some of the prior photo electric scanning devices have been designed so as to determine the presence of differently colored dots on film or other similar material. In a construction of this category as well as construction in which an opaque or substantially opaque card is punched there frequently is a problem because of the amount of information which can be stored on a given area within a predetermined pattern. For many operations it is normally desired to store many more "bits" of information than can be located upon conventional cards, films and the like.

A basic objective of this invention is to teach tabulating constructions which are adapted to contain much more information within a given area than can be contained within an equivalent given area or prior tabulating cards or the like. A more specific object of this invention is to provide tabulating cards which are specifically adapted to be used with radiant energy sources and means for detecting radiant energy so that they may be readily scanned at an extremely high rate. A further object of this invention is to provide tabulating cards in which the radiant energy referred to above consists of a common light and in which given areas or sections of a tabulating card or other similar storage media such as, for example, a film are adapted so that a number of different "bits" of information may be stored within any such given area or section. Another object of this invention is to provide tabulating constructions of this category utilizing magnetic storage means located between the various colored areas or sections referred to in the preceding.

Still further objects and advantages of this invention will be more fully apparent to those skilled in the art to which this invention itself pertains from a detailed consideration of the remainder of this description and the appended claims in which:

Fig. 1 is an isometric view of a tabulating card of the present invention having "bits" of information indicated upon it; and

Fig. 2 is a diagrammatic view showing the use of the tabulating card illustrated in Fig. 1 and containing a partial cross-sectional view of the tabulating card illustrated in Fig. 1 taken at line 2—2 of Fig. 1.

In both figures of the drawing like numerals are used to designate like parts. The accompanying drawing is primarily intended so as to clearly illustrate what is considered to be a presently preferred construction of this invention. Obviously the various sizes and shapes of the parts of the tabulating card illustrated may be changed within comparatively wide limits without departing from the essential features or principles of this invention.

As an aid to understanding the invention itself, it may be stated in essentially summary form that it involves tabulating constructions which are formed so as to include a piece of material such as, for example, a piece of film or a card. This piece of material in these constructions must be capable of absorbing at least some radiant energy, and is divided into sections, at least some of which sections may be removed from the piece of material itself. Upon the piece of material used another material, capable of absorbing at least some radiant energy, is located on at least some of said sections of this piece of material.

A construction of this category is designed so that a source of radiant energy may be deposited upon one side of a section such as indicated and a means for detecting radiant energy may be located on the other side of this section. These two means when operated in conjunction with one another in an established manner are capable of being used so as to determine whether a section of a piece of material has had a material within this section removed from it and are capable of determining whether either of said other materials or said further material, or both, are located upon said section of this piece of material.

The actual nature of this invention is easily explained by referring directly to the accompanying drawing where there is shown a tabulating card construction 10 of this invention which is built about a transparent card 12 formed out of any of a number of different known resinous materials, such as, for example, certain cellulose derivatives or the like. Preferably the card 12 is transparent and is colored a first color, such as, for example, yellow. It is divided into a plurality of sections 14 which are arranged in rows in an established manner so as to fall within a predetermined pattern. Certain of the sections 14 are adapted to contain holes 16 such as may be punched with the card 12 by known mechanisms. Other of these sections 14 are adapted to carry small areas 18 of another material such as, for example, an appropriately transparent film layer colored a different color from the card 12 itself. Upon the other surface of the card 12 the same or other sections 14 of the card are adapted to carry further areas 20 of a similar composition to the areas 18. Both of the "areas" referred to here may be of the same or similar composition. Preferably the materials used in there are each of a different color and both differ in color from the card 12. Thus, the areas 18 and 20 may be blue and red respectively if the card 12 is yellow; these areas 18 and 20 may be formed by printing, stamping or further known processes.

With the preferred construction of this invention strips 22 of a conventional type of known magnetic storage material are located upon at least one surface of the card 12 between the various sections 14, although if desired, such strips 22 may be located on both surfaces of this card 12, or may completely cover this card. The strips 22 are opaque and, hence, serve to prevent light

from going through other than a desired section 14 of the card itself. Also they provide a convenient storage means of a magnetic nature for the storage of information if an extreme quantity of information should, for any reason, be stored upon one of the card constructions. Obviously these strips can be omitted, or replaced by opaque coatings of other materials.

The use of the card construction 10 is illustrated in essentially a diagrammatic manner in Fig. 2 of the drawing. For convenience a series of incandescent light sources 22 are shown here. These sources may be of a white light with the embodiment of the invention shown, although they may be sources of colored light or lights. Sources of other types of radiant energy may be substituted for them. On the side of the card construction 10 remote from these sources 24 there are illustrated a series of photocells 26 which are adapted to detect the presence of radiant energy such as light. Various known appropriate light filters 28 may be used with the photocells 26 in order to insure the effective operation of these photocells with only the desired type of radiant energy.

While a series of light sources and means for detecting radiant energy have been shown in this figure of the drawing it is to be understood only a single source of and a single means for detecting radiant energy may be used with a tabulating card construction 10, if the end is moved during a scanning. Various equivalents may be substituted for the filters 28 or these filters may be dispensed with.

Fig. 2 of the drawing is primarily intended merely to show the manner in which the tabulating card construction of this invention may be "read out"; the equipment for this purpose may vary within extremely wide limits and such equipment may be readily designed by the adaptation of scanning equipment of known varieties.

In Fig. 2 it is shown that where a hole 16 is formed in a section 14 of the card 12 light will go directly through a filter 28 to the photocell 26. Where one of the sections 14 of these cards is covered with an area 18 an additive effect will be obtained from light projecting through the section 14 indicated, and the additive color obtained can be detected by means of the appropriate photocell 26. With the colors named, this additive color will be green. Where one of the sections 14 is provided with one of the further areas 20 a similar additive color will be obtained by light projected through the particular section 14 and this color will also be detected on one of the corresponding photocells 26. In this case the additive color will be orange. Where one of the sections 14 is covered by both one of the other areas 18 and one of the further areas 20 and light is projected through the section an additive color effect is obtained and the photocell 26 located beneath this section will determine essentially the additive color. In the example given this color will be a black shade. In using the construction in this nature the strips 22 will serve to prevent light from going other than directly through the sections 14. The presence of unaltered sections 14 may be determined in a similar manner.

Obviously the number of modifications can be made within the basic concept of this invention. The type of construction shown involving various colors is preferred because of the fact that with it an essentially "sharp" signal may be obtained from photocells when a tabulating construction of this invention is scanned. Since photo electric equipment is available it will detect intensity of light, it is possible to form the areas 18 and 22 and the card 12 of the same or other colors so that the intensity of the light transmitted to the means for detecting radiant energy employed is determined. Similarly it is possible to form the card 12 so that it is capable of polarizing light and to form the areas 18 and 20 out of compositions capable of polarizing light, all of these materials being formed as to polarize light in different

planes. This type of construction is not considered preferable with the invention because of a number of technical problems as well as the difficulty of obtaining a "sharp" electric signal from a photocell.

While this invention has been described primarily in conjunction with its use with light the basic principles here shown and described may be used with other forms of radiant energy, such as, for example, X-rays or the like, by using different materials capable of absorbing radiant energy of the type employed. Obviously it is not necessary that a tabulating construction of this invention actually employ all of the various means herein indicated for use in detecting various indicia upon these constructions. Thus, for example, effective tabulating cards can be created by omitting holes, such as the holes 16. Also only two different materials or layers can be employed instead of three as illustrated and described. Also various alignment means or the like can be used with the constructions of this invention, or if desired, the magnetic strips 22 can be employed for this purpose. Because of the fact that the construction of this invention can be used in a wide variety of manners and are capable of a great deal of modification, the invention is to be considered as being limited only by appended claims, and these claims in turn are to be interpreted in the light of this specification and the patent doctrine of equivalents.

We claim:

1. A tabulating construction of the class described which comprises: a piece of material capable of absorbing some radiant energy, said piece of material being divided into sections, at least some of said sections being adapted to contain holes formed in said piece of material; another material capable of absorbing some radiant energy located on at least some of said sections of said piece of material; a further material capable of absorbing some radiant energy located on at least some of said sections of said piece of material, said materials capable of absorbing radiant energy being located on opposite sides of said piece of material at least some of said sections containing said other material and said further material on the sides thereof, said materials being aligned.

2. A tabulating construction of the class described as defined in claim 1 wherein at least some of said sections are separated by magnetic storage means located on said piece of material.

3. A tabulating card construction which comprises: a card formed of a colored material capable of absorbing some radiant energy, said card being divided into sections, said sections being adapted to be removed from said card; another colored material capable of absorbing some radiant energy located on some of said sections of said card on one surface of said card; and a further colored material capable of absorbing some radiant energy located on some of said sections of said card on the surface of said card remote from said other material at least some of said sections containing both said other and said further colored materials on the surfaces thereof, said materials being aligned.

4. A tabulating card construction as defined in claim 3 wherein at least some of said sections of said card are separated by magnetic storage means located on said card.

5. A tabulating card construction as defined in claim 3 wherein said sections are separated by opaque material located on said card.

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