United States Patent

Dimitracopoulos

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[54] AUDIOVISUAL PROJECTION SLIDES

[72] Inventor: **Panayotis C. Dimitracopoulos,** Montreal, Quebec, Canada

[73] Assignee: **The A. V. Corporation N. V.,** Curacao, Netherlands

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[52] **U.S. Cl.** .....**353/120,** 40/28.1, 274/42 R, 353/19

[51] **Int. Cl.** **G03b 21/00**

[58] **Field of Search** .....274/42, 42 P; 40/28.1, 340, 40/152; 353/19, 120

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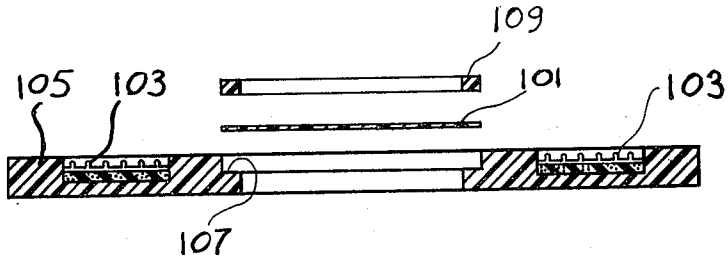
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Primary Examiner—Samuel S. Matthews
Assistant Examiner—Richard M. Sheer
Attorney—Homer R. Montague

[57] **ABSTRACT**

An audiovisual projection slide having a spiral sound track surrounding a projectable transparency, the sound track being formed on a magnetized film impressed with a spiral groove and the magnetized film having optionally beneath it a spongy, resilient, backing layer. The slide may constitute a data record card carrying on its surface the spiral sound track surrounding a window adapted to receive a projectable transparency, but in this case, the spiral sound track may also be of other desirable types, for example, phonographic.

8 Claims, 24 Drawing Figures



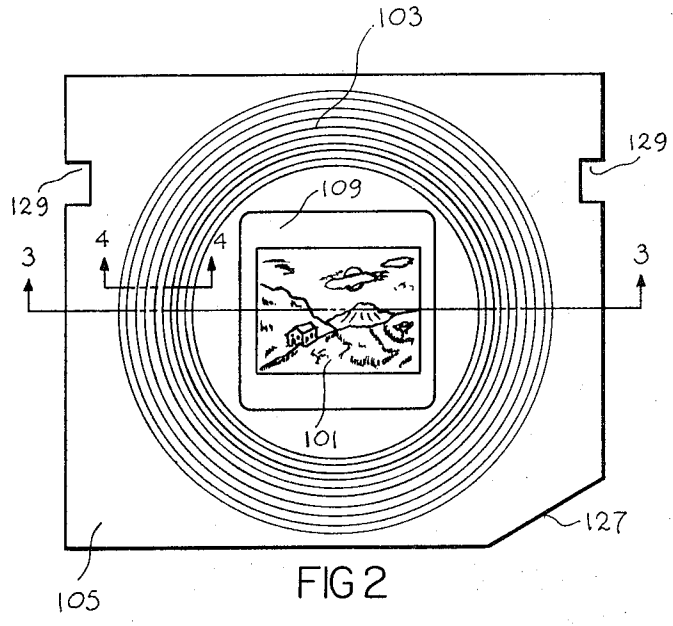


FIG 2

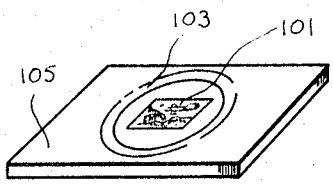


FIG 1

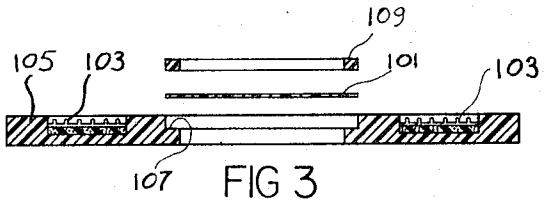


FIG 3

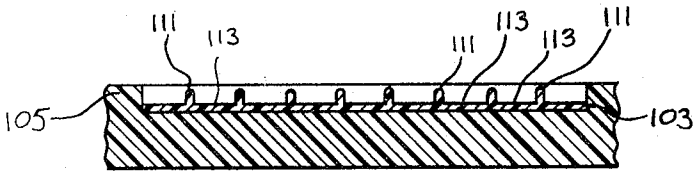


FIG 4

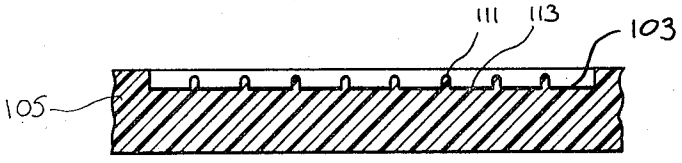


FIG 5

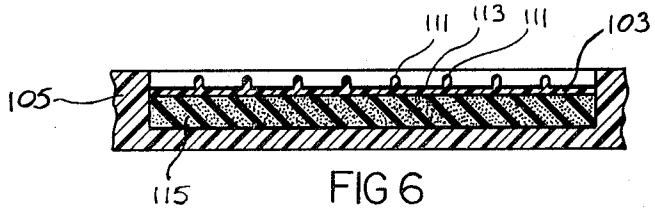


FIG 6

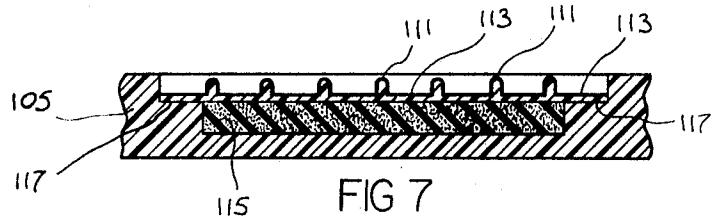


FIG 7

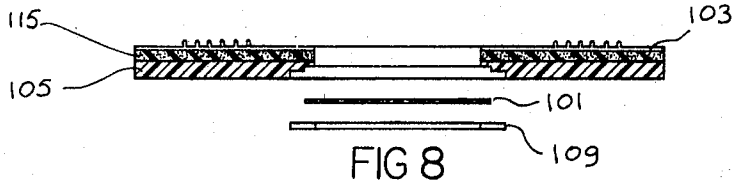


FIG 8

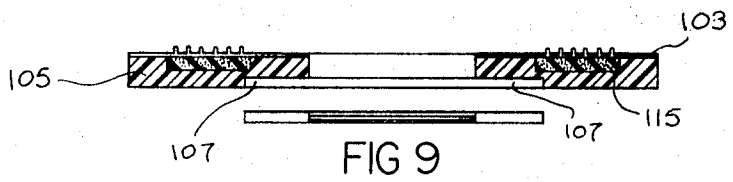


FIG 9

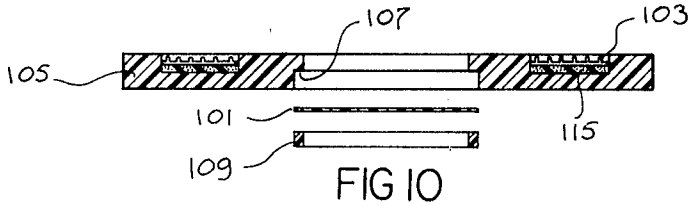


FIG 10

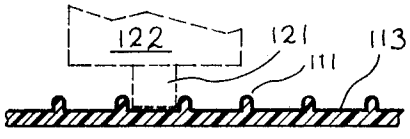


FIG 11



FIG 12



FIG 15A

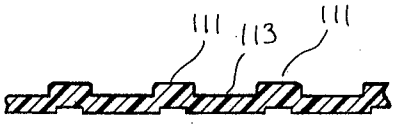


FIG 13

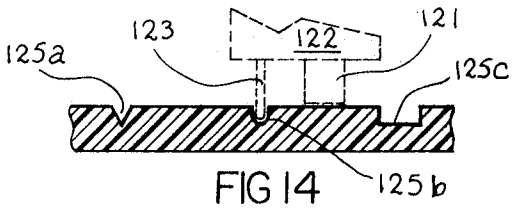


FIG 14

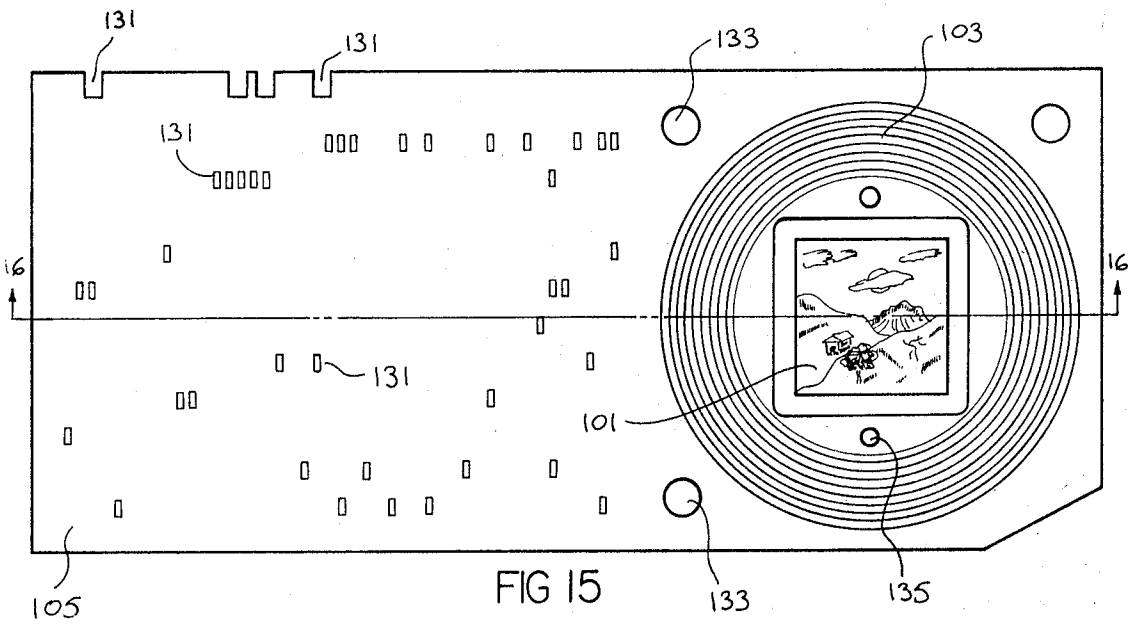


FIG 15

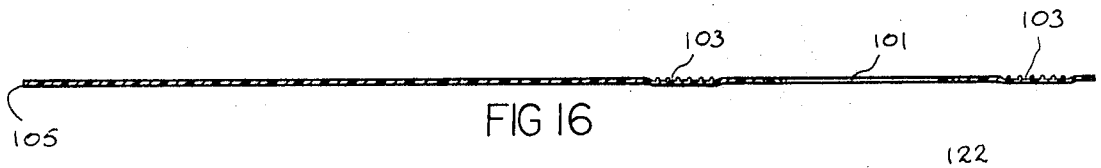


FIG 16

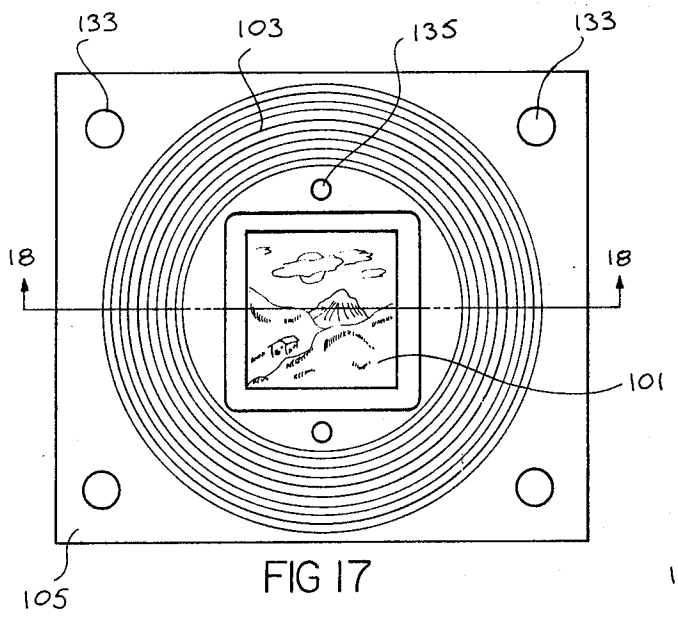


FIG 17

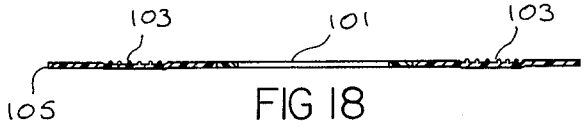


FIG 18

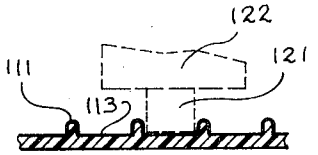


FIG 19

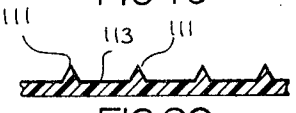


FIG 20



FIG 21

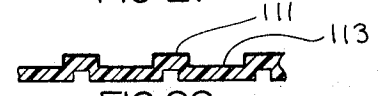


FIG 22

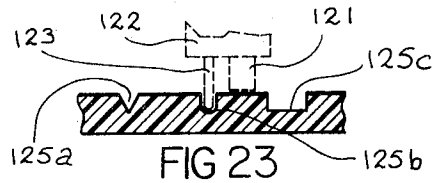


FIG 23

AUDIOVISUAL PROJECTION SLIDES

This invention has to do with audiovisual projection systems, and in particular to systems of this kind in which individual slide elements or units incorporate both a projectable optical representation or image, either as a monochrome or color projection positive, and a sound record in the form of a spiral sound track, groove or the like. In addition, the invention provides improved special forms of audiovisual slides or projection units, adapted for either small-scale or individual preparation of the units, or the mass reproduction thereof, to satisfy the needs of a variety of particular applications.

Photographic slides have become a popular and acceptable medium for the display of visual information, since they are relatively simple and inexpensive to prepare, both individually and as quantity reproductions, and can be projected to any desired enlargement with good definition and excellent color rendition. Their use in education, entertainment, industrial training, advertising and similar fields is commonplace. Efforts to provide a system in which the projection of individual slides is accompanied by "synchronized" sound information have met with great difficulty, for reasons familiar to those working in this field. The usual prior approach has been the use of separate projectors and phonographs or tape reproducers, sometimes assembled in a single housing. Since separate media were carrying the picture and sound, automatic synchronization or complete integration of sound and picture was practically impossible.

U.S. Pat. Nos. 3,302,520 and 3,282,154, in which the inventor of the present invention is a coinventor, solved the synchronization difficulty by directly and permanently associating a generous length of recorded sound (audio) information with each visually projectable image or visual slide unit, in such a way that a properly designed projector, as described in U.S. Pat. Nos. 3,122,053 and 3,122,054 in which the inventor of the present invention is also the coinventor, and copending U.S. Pat. application Ser. No. 615,140, filed concurrently herewith, by the present inventor can simultaneously reproduce both audio and visual records of a slide unit, individually or sequentially, without any special requirement as to synchronization, the latter following inevitably from the fact of integration of the two kinds of records upon a single record unit.

Therefore, the present invention is a further improvement of the audiovisual tablets (audiovisual slides) described in the above-mentioned U.S. Pat. Nos. 3,302,520 and 3,282,154 and pertains specifically in a form of audiovisual slides consisting of a projectable optical transparency, such as a projection diapositive, positive film, or the like, carried directly upon, or forming part of, a sound record of the pregrooved, spiral type, preferably, but not necessarily magnetic type, adapted for ready reproduction by a special form of rotating transducer (for example, but not exclusively, a magnetic pickup head). In particular, the audiovisual record of the present invention is employed with a special audiovisual reproducer (described in U.S. Pat. Nos. 3,122,053 and 3,122,054 and U.S. Pat. application Ser. No. 615,140) that permits the audiovisual record to be held stationary, while the audio reproducer is rotated around the optical projection beam and follows the groove of the sound track, and thus senses and reproduces the sound information contained therein.

The present invention further pertains to specific types and forms of sound grooves, to resilient backings under these grooves, to methods of securing or bonding the various layers of materials to one another and to the diapositive projectable image. It also pertains to specific and particularly useful geometric configurations of the audiovisual slides or tablets, which make possible the above, assist the insertion, and ensure the proper orientation of the audiovisual slides in the properly designed audiovisual reproduction apparatus.

The invention will be described herein by reference to certain presently preferred specific embodiments thereof, with regard to the construction of the audiovisual information units (audiovisual slides), however, it will be understood by those

skilled in the art that the principles of the invention can be carried out by specifically different physical devices, and that in using words of limited meaning for the better understanding of the particulars of the forms chosen for description and illustration, it is not intended to exclude variations of those details which properly fall within the scope of the invention in its broader aspects.

The invention will now be described in some detail in connection with the specific chosen embodiments thereof, reference being made to the accompanying drawings, in which:

FIG. **1** is a perspective view of a typical audiovisual slide according to the invention.

FIG. **2** is a plan view of an embodiment of an audiovisual slide according to the invention.

FIG. **3** is an exploded sectional view taken along line **3—3** of FIG. **2**, the thickness of the section being somewhat exaggerated for illustrative purposes.

FIG. **4** is an enlarged sectional view taken along line **4–4** of FIG. **2**, this view showing a greatly enlarged segment of the cross section of the audiovisual slide according to the invention. FIGS. **5**, **6**, and **7** are similar sectional views of other types of audiovisual slides according to the invention.

FIGS. **8** and **9** are exploded sectional views of still other types of audiovisual slides according to the invention.

FIGS. **10** is an exploded sectional view of another type of audiovisual slide according to the invention.

FIGS. **11**, **12**, and **13** are sectional views of segments of a pregrooved magnetic material or sheet or layer, illustrating a few typical forms, among the several possible forms, that the grooves may take.

FIG. **14**, is still another sectional view similar to FIGS. **11**, **12**, and **13**, illustrating three more typical grooves (*a*, *b*, and *c*) the function of which will be described later.

FIG. **15** is a plan view of still another embodiment of an audiovisual slide according to the invention, particularly useful when used in connection with automatic sorting and classifying machines, as will be described below.

FIG. **15A** is a view similar to FIG. **11** of a further variation.

FIG. **16** is a sectional view taken along line **16—16** of FIG. **15**.

FIG. **17** is a plan view of still another embodiment of an audiovisual slide according to the invention.

FIG. **18** is a sectional view taken along line **18—18** of FIG. **17**.

FIGS. **19**, **20**, **21**, **22**, and **23** are typical sectional views of segments of the grooved portions of the audiovisual slides illustrated in FIGS. **15**, **16**, **17** and **18**.

FIG. **1** is a perspective view of a typical audiovisual slide in accordance with the invention, for example of rectangular shape, provided substantially at its central portion with a projectable diascopic transparancy **101**. Numeral **103** designates the spiral sound track, preferably of the magnetic or phonographic type, which is fixedly disposed on the slide's frame **105**, and around the transparency **101**.

FIG. **2** is a plan view of another typical embodiment of the invention, while FIG. **3** is an exploded sectional view taken along line **3—3** of FIG. **2** (the thickness of the section being exaggerated for illustrative purposes) and FIG. **4** is an enlarged sectional view taken along line **4–4** of FIG. **2**.

The general principle of the invention will now be described with reference to FIGS. **2**, **3**, and **4**: numeral **105** designates the frame or plate of the audiovisual slide, its thickness depending on the type and method of mounting of the transparency **101**, the spiral sound track **103**, the requirements of the audiovisual reproduction apparatus, etc. Substantially at its center, the frame **105** carries the transparency **101**, and while several methods are possible for fastening or bonding this transparency on the frame, one will be described now as an illustration: the frame **105** may have a rectangular opening, substantially in its center, the cross section of this opening being of stepwise construction. The transparency **101** fits into the opening, and is prevented from falling out by the step **107**,

while an apertured frame **109** fits, over the transparency, and is snapped on, or generally held by, frame **105**. A doughnut-shaped thin sheet, for example a sheet of plastic material, is covered with a thin layer of magnetic particles, for example iron oxide particles, in the manner well known in the art, and is formed with a spiral wall **111**, which rises above the principal plane of the sheet, and thus separates adjoining flat portions **113** from one another. This construction resembles, somewhat, a phonographic record, except that the bottom of the grooves **113** are relatively wide and flat. Thus, the tip, or as it is better known in the art, the "shoe" of a specially constructed magnetic transducer, otherwise known as "magnetic head," may snugly fit between two adjoining walls **111**, rest on the flat portion **113**, and when moved at the proper speed, follow the spiral path and record or reproduce a sound or other signal on or from the magnetic record, in the known "magnetic tape" fashion.

This doughnut-shaped sheet carrying the spiral magnetic sound track may be cemented, fused or otherwise secured on the frame **105**, or, as illustrated in FIG. **5**, the frame **105** itself, may be formed with a spiral groove of the appropriate shape and size and covered with a layer of magnetic oxide.

It is well known in the art that for good sound recording and reproduction the "shoe," or tip, of the magnetic transducer must be in perfect contact with the magnetic oxide layer. It has been found that a good contact is greatly assisted when the magnetic oxide layer is backed up by a resilient material, so that the flat part **113** may "float" or slightly move. This may be accomplished—as illustrated in FIGS. **6**, **7**, **8**, **9**, and **10**—by interposing between the magnetic-oxide-carrying sheet and the frame **105**, a layer of resilient material **115**, for example a resilient foam, like rubber-foam, or any other appropriate foam or the like.

In FIG. **6** the various layers have been shown secured to one another, for example by means of cement, adhesives, heat bonding and the like. The methods of securing the layers to one another are, of course, many, and may vary according to the required objectives, but as an illustration, another method is shown in FIG. **7**. The frame **105** is formed with a stepwise recess, the resilient material **115** fitting at the bottom, while the edges of the magnetic-oxide-carrying sheet, rests on steps **117**, and is cemented, heat-fused or otherwise bonded or secured to them.

In FIG. **3**, step **107**, the transparency **101** and the apertured frame **109** are shown to be disposed on the same side as the magnetic grooves **103**. They could be, of course, on opposite sides, as illustrated by FIG. **10**. In fact the methods of securing the projectable transparency to the frame are too numerous to illustrate and describe, and only a few have been shown as typical examples: first, the projectable transparency may form a unitized, inseparable part of the frame **105**. In this case, the portion of the frame exposing the image, is transparent, and is coated with a photographic emulsion, exposed to an image, and processed in the usual photographic way or instead of using photographic emulsion, it may be printed or otherwise imprinted with the image information. On the other hand, the projectable image may be carried on a separate layer or sheet, and secured, cemented or otherwise bonded on the audiovisual frame **105**. The separate layer carrying the image may also be the usual monochrome or color photographic transparency (for example, the so-called "35 mm. slide-chip"), which may be nested in a single-step recess, (as in FIGS. **3** and **10**) or a double-stepped recess (as in FIG. **8**,) of frame **105**, and cemented or otherwise bonded on this frame **105**, or a separate apertured frame **109** may be inserted, over the transparency to prevent the transparency from falling out, and this apertured frame **109**, may again be cemented, or otherwise bonded, or it may "snap-in" the recess or step **107** of frame **105**. This apertured frame may have any appropriate thickness, for example, substantial thickness as illustrated in FIGS. **3** and **10** or it may be thin or very thin, as illustrated in FIG. **8**, or it may be made of paper or thin plastic or metal. Numeral **101** of FIGS. **3**, **8** and **10** may not necessarily designate a simple "slide-chip," but, as is the common practice today, this "slide-chip" may be mounted in a cardboard, plastic, or metal slide-frame, as for example in the usually employed 2×2 slide-mounts. Accordingly, numeral **101** of FIGS. **3**, **8** and **10** may also designate a completely "mounted" transparency. FIG. **9** is a further illustration of how a "mounted" transparency fits into the recess **107** and is cemented or bonded thereon, or a separate (now shown) slide-holding frame or apertured layer may be placed over it to prevent it from falling out of the recess or step **107** of frame **105**, as illustrated in exploded FIGS. **3**, **8** and **10**.

The resilient backing **115** and/or the magnetic-grooves-carrying layer, may not necessarily be doughnut shaped, or do not have to nest into a recess of the frame **105**. Several alternatives, within the spirit of the invention, are possible, and as an illustration, FIGS. **8** and **9** have been drawn. For example, in FIG. **8** the resilient backing **115** and the groove-carrying layer **103** are shown as extending over the whole surface of the frame **105**. Of course, any of these two layers **115** and **103** may only extend over a part of the frame **105**, as, for example, illustrated in FIG. **9**, where only the sheet **103** extends over the whole surface. Other variations, too numerous to enumerate, describe and illustrate, are also possible, within the spirit of the invention.

Finally, the grooves themselves and/or the shape of the walls separating them may take any appropriate shape or form, and FIGS. **11**, **12**, **13**, **14**, and **15A** are illustrations of a few of the possible alternatives.

FIG. **11** illustrates how the shoe **121** of the magnetic transducer **122** snugly fits and is guided by two "walls" **111**, while the "working" surface of the shoe, or pole-tip, smoothly rides in contact with the flat, information-carrying, surface **113** (the shoe **121** and transducer **122** shown in dotted lines). The shoe can be guided in other ways, as for example, illustrated in FIG. **14**. Here the shoe **121** follows the flat magnetic sheet, guided by a stylus **123** which follows a recessed groove of appropriate shape, for example **125***a*, **125***b* or **125***c*.

The magnetic oxide may have been placed at the bottom of the spirals (or the top in case of FIG. **14**), while the "walls" **111** (or recesses **125**) or free of oxide, or alternatively, the whole surface, walls and/or recesses including, may be covered with magnetic oxide.

The spiral grooves may be formed before, or after, the surface of the plastic-base or paper material has been "coated" with the magnetic oxide. The spiral grooves may also be "-cast" or "molded" into the plastic-base material, or alternatively sheets of plastic may be "pressed" or "embossed" with the spiral grooves, in which case, segments of their cross sections may take a form approximately as illustrated in FIGS. **13** and **15A**.

It is usually necessary to properly orient the audiovisual slide in the slide-carrying magazine, or the recording and reproducing apparatus, and therefore, a "notch" may be made at an appropriate place on the frame, as for example illustrated by missing corner **127** on FIG. **2**. Additional notches or holes may be placed on the frame, to accomplish various function, for example notches **129** in FIG. **2**, used for inserting appropriate levers, "arms" or "fingers" of the recording and reproducing apparatus, to lift, push or carry the audiovisual slide into the proper position of the apparatus.

The reader of the preceding description might have come to the conclusion that the frame **105** is of substantial thickness. This is not necessarily so. In fact this frame **105**, may have any desired thickness, for example, substantial thickness, or may be very, or even extremely, thin. In fact, FIGS. **15**, **16**, **17** and **18** illustrate audiovisual slides of thin or very thin cross section.

FIGS. **17** and **18** illustrate a thin audiovisual slide, which may be formed, if desired, on a single plastic sheet **105**. This plastic sheet carries the diapositive, projectable image **101**, and is also formed with the sound track grooves **103**. The projectable image may have been formed by coating the plastic sheet **105** with the usual photographic (monochrome or

color) emulsion and then processing it in the usual photographic fashion, while the sound grooves may have been cast, pressed, embossed, etc., on its surface, which also carries the usual magnetic oxide coating in the desired portions.

It is evident that the audiovisual slides of FIGS. **17** and **18** may not necessarily be formed on "one single plastic sheet", as above-described. The frame **105**, the grooved portion **103** and the image portion **101**, may be carried-on, or formed-on, more than one sheet or layer, properly secured or bonded on one another, so that the end product substantially resembles the illustrations **17** and **18**. It is also evident that "plastics" are not the only possible material used in the above-described audiovisual slides, but also metal, cardboard and paper may be used, depending on the desired use and application.

It is furthermore evident that the sound track is not necessarily substantially in the center of the audiovisual slide. This is illustrated in FIGS. **15** and **16** where the frame **105** extends to one side, so that it may carry descriptive information, handwritten, printed, typed, printed or written with magnetic ink and the like, or carrying the usual perforations **131**, or the usual marks, cutouts or perforations employed in automatic sorting and processing cards.

Appropriately placed holes or perforations, for example as illustrated by numerals **133** and/or **135**, may assist in the proper positioning of these audiovisual slides in the properly designed reproduction apparatuses. Cutouts or perforations of different shapes, as desired, may also be employed, or placed in other locations as needed.

When the audiovisual slides have a substantially thin cross section, for example as illustrated in FIGS. **15**, **16**, **17** and **18**, it is not essential to employ a resilient backing behind the spiral sound track, because the entire slide may be placed—if desired—on a resilient pad—for example a rubber or foam pad—forming part of the sound-recording and/or reproduction apparatus. FIGS. **19**, **20**, **21**, **22** and **23** are cross sections of segments of the groove portions of a few typical forms of the substantially thin audiovisual slides. These figures are otherwise similar to the previously illustrated and described FIGS. **11**, **12**, **13**, **14**, and **15A**.

The above-described audiovisual slides, and particularly those illustrated in FIGS. **15**, **16**, **17** and **18**, may carry the sound not only in a "magnetic track or groove" but also in other types of spiral tracks or grooves, for example spiral photographic track, or spiral phonographic grooves. The spiral phonographic groove is of particular interest and usefulness, as it may be duplicated, at very low cost, by the usual phonographic-disc-pressing techniques. Thus, thin audiovisual slides, such as those illustrated in FIGS. **15**, **16**, **17** and **18**, may carry the image and sound on one single layer, the sound groove having been pressed by the usual phonographic process. Since they may also carry perforations or magnetic or other signals, they may be processed, sorted and selected by the automatic card-processing machines, and thus, a single card, may carry visual-projectable, audible and computer information, and such card, regardless of whether the sound track is magnetic, phonographic or of other types, may have a staggering number of uses and applications in entertainment, education, advertising, information-storing techniques, and business.

While a number of specific embodiments of the invention have been disclosed herein, it will be understood that various modifications and variation, within the spirit of the invention, may occur to those skilled in the art.

What is claimed is:

1. A unitary combined sound and picture-projection slide comprising a flat and substantially rectangular support formed with an aperture receiving and fixedly holding a projection transparency; said support fixedly carrying a magnetizable thin plastic sheet impressed with a raised narrow spiral wall whose convolutions are spaced to define a stationary, spiral magnetic sound track along which track the shoe of a magnetic transducer may be guided between adjacent convolutions of said wall, said track substantially surrounding said aperture, said slide including a layer of resilient cushioning material between said support and said sheet, thus allowing elementary areas of said sound track to move and float under the pressure of said shoe, and thus ensuring good contact between the surface of said sound track and said shoe during recording, reproducing and erasing operations.

2. An audiovisual slide according to claim **1**, in which said sheet has the form of a flat ring surrounding said aperture.

3. An audiovisual slide according to claim **1**, in which said layer of resilient cushioning material has the form of a flat ring surrounding said aperture.

4. An audiovisual slide according to claim **1**, in which the surface area of said sheet is substantially the same as that of said support and said sheet having a window overlying said aperture.

5. An audiovisual slide according to claim **1**, in which the surface area of said layer is substantially the same as that of said support, and said layer having a window overlying said aperture.

6. An audiovisual slide according to claim **1**, in which said layer is a layer of foam plastic.

7. An audiovisual slide according to claim **1**, in which said layer is a layer of sponge rubber.

8. An audiovisual slide according to claim **1**; said support having handling notches formed in each of two opposite edges thereof.

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