United States Patent [19]

Dimitracopoulos

[11] **3,883,238**

[45] **May 13, 1975**

[54] **AUDIOVISUAL SLIDES AND APPARATUS**

[76] Inventor: **Panayotis C. Dimitracopoulos**, P.O. Box N-7776, Nassau, Bahamas

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[52] **U.S. Cl.** **353/19**; 353/120

[51] **Int. Cl.** **G03b 31/06**

[58] **Field of Search** 353/15–19, 353/120

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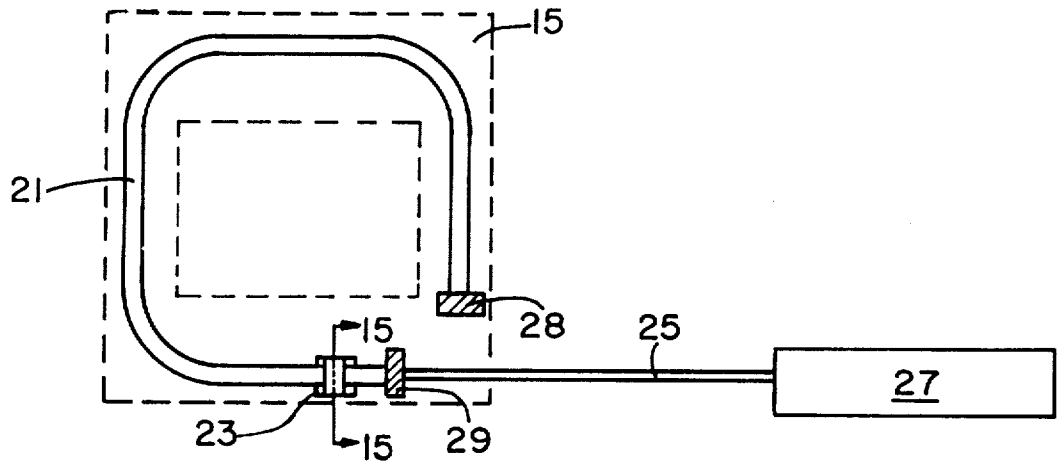
Primary Examiner—Richard E. Aegerter
Assistant Examiner—A. J. Mirabito

[57] **ABSTRACT**

Audiovisual slides each having a projectable image and a sound and information track adjacent said image.

Audiovisual projectors, accepting for audiovisual reproduction the above referred audiovisual slides, incorporating optical projection means and travelling transducers moving along the path of the information track in an information-scanning relationship.

9 Claims, 25 Drawing Figures



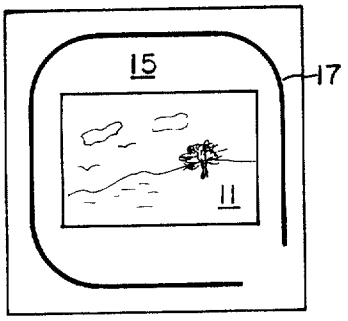


FIG. 1

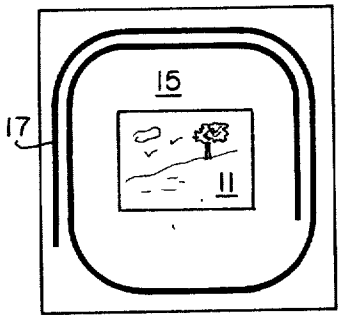


FIG. 2

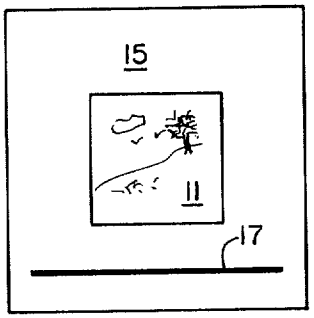


FIG. 3

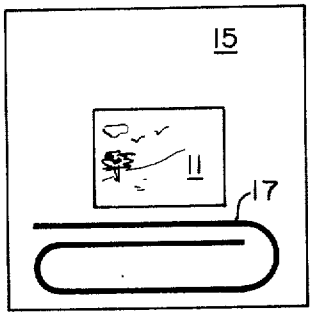


FIG. 4

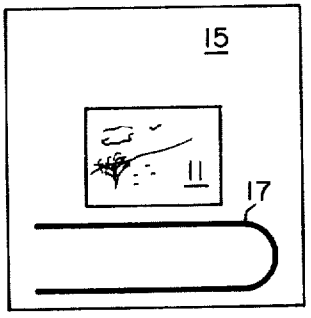


FIG. 5

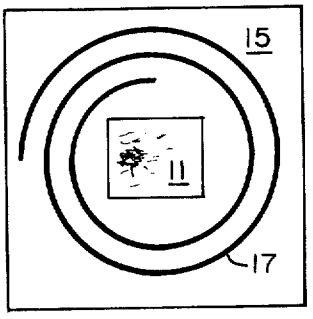


FIG. 6

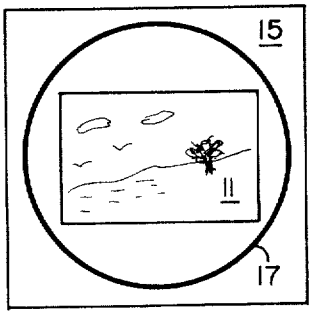


FIG. 7

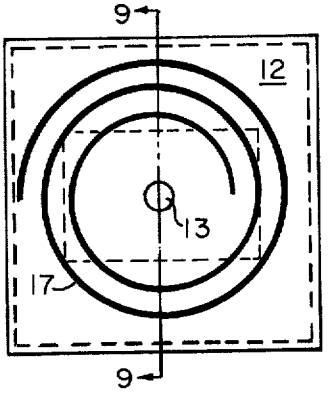


FIG. 8

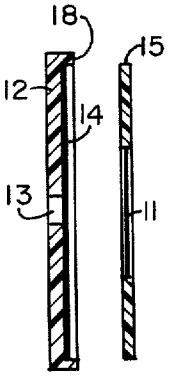


FIG. 9

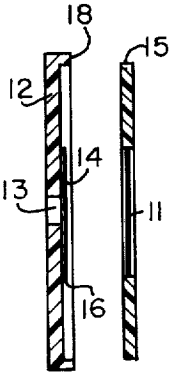


FIG. 10

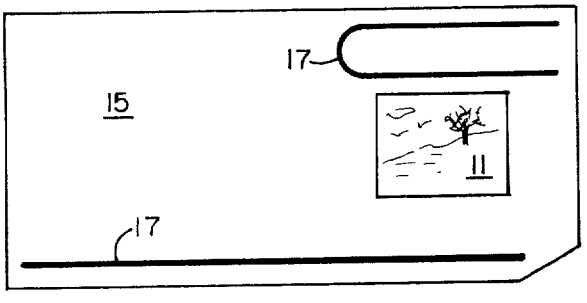


FIG. 11

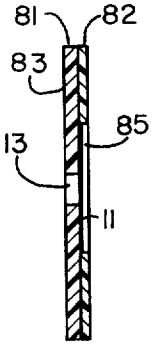


FIG. 12

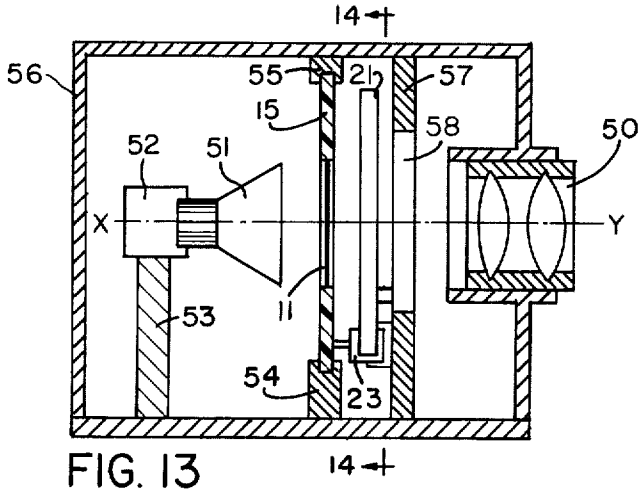


FIG. 13

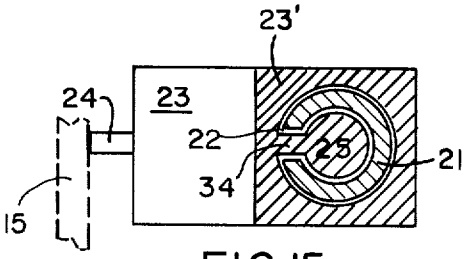


FIG. 15

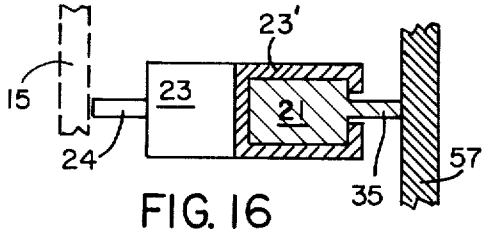


FIG. 16

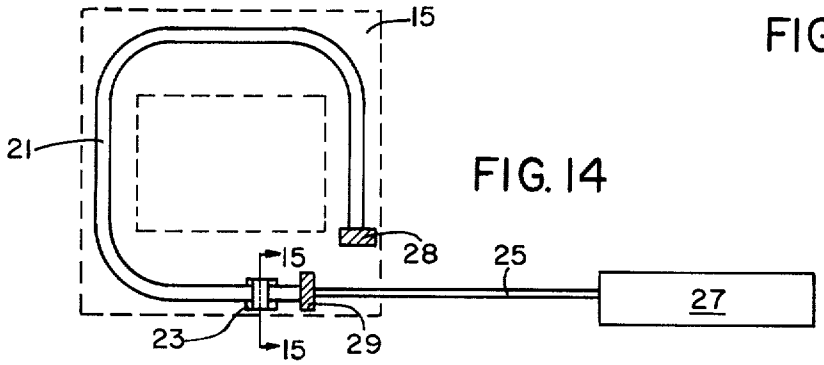


FIG. 14

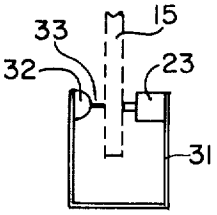


FIG. 20

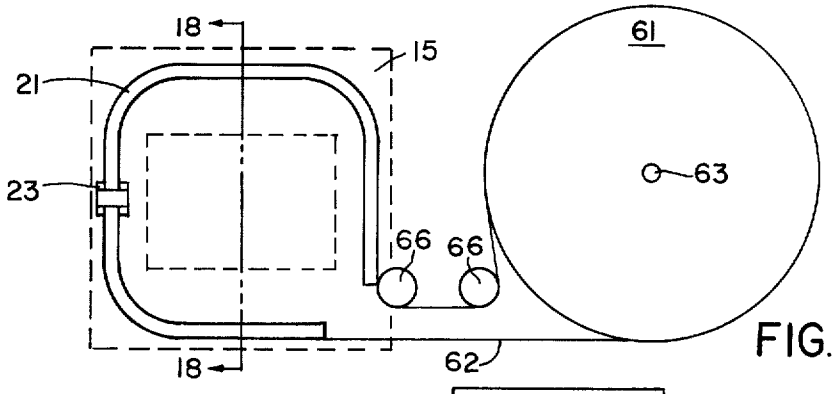


FIG. 17

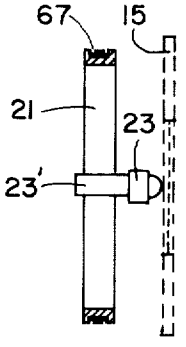


FIG. 18

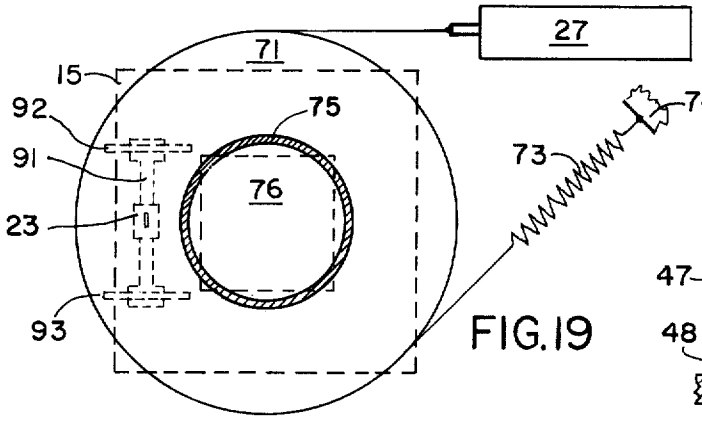


FIG. 19

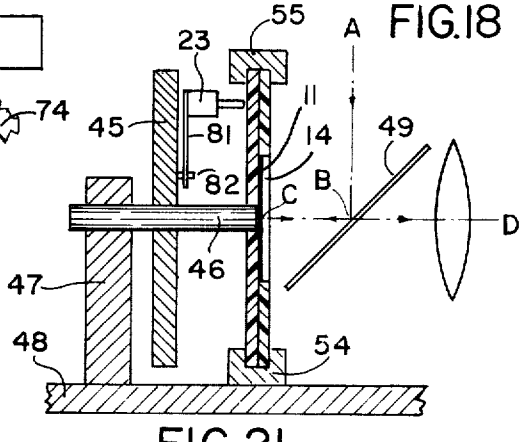


FIG. 21

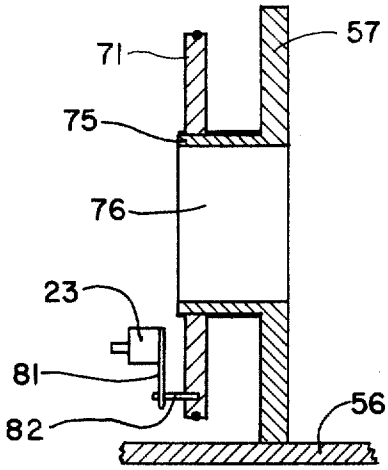


FIG. 22

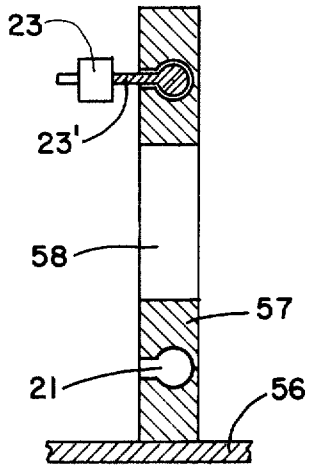


FIG. 23

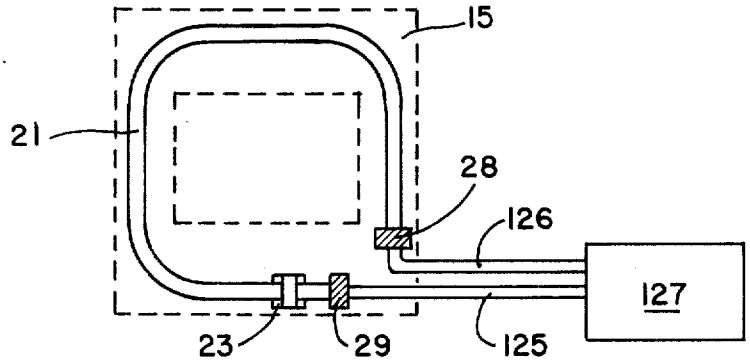


FIG. 24

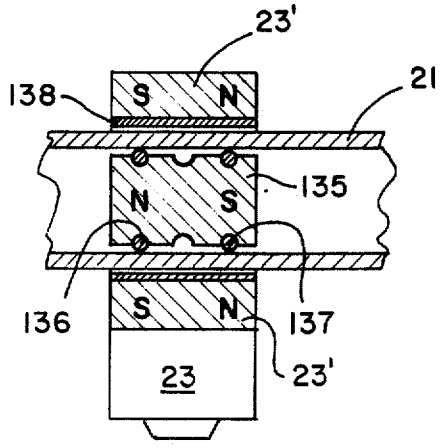


FIG. 25

AUDIOVISUAL SLIDES AND APPARATUS

FIELD OF INVENTION

This invention relates to audiovisual slides, i.e., projectable images such as transparencies, incorporating a sound and information track.

This invention also relates to audiovisual apparatuses accepting for audiovisual reproduction the abovedescribed audiovisual slides.

DESCRIPTION OF THE PRIOR ART

In the early days, there was no speech associated with motion pictures. Background music was sometimes provided from separate phonographs but adding speech was not possible, since there was no way that the two separate media could be synchronized. "Silent" movies became "talkies" when a method was found to permanently record sound right on the film itself. This breakthrough made movies one of the most important media in the entertainment, educational, promotional and advertising fields.

Still photography preceded in the movies. But the size of the average picture is quite small and can only be viewed by a few people at a time. When large audiences are present, projectable transparencies or slides are employed, but this medium remains essentially at the stage that the motion pictures were at the turn of the century. They remain "silent pictures".

Attempts have been made to remedy this situation and, in fact, in several of his prior patents, the inventor of the present invention taught methods and means for fully integrating sound with individual projectable images. According to these teachings, a sound track is disposed in a spiral fashion around the image and is scanned by a transducer rotating around the optical projection beam. Such audiovisual slides and audiovisual apparatuses have special and novel features and attributes which are disclosed, illustrated and claimed in the abovementioned several patents. Highly successful embodiments of the abovereferred to principles were demonstrated by the instant inventor during the summer of 1961 at the National Audiovisual Association's Convention in Chicago. Other versions and embodiments were built and demonstrated by the instant inventor prior to that date, as well as thereafter, and are presently the subject of commercial manufacture. Nevertheless, "talking slides" and audiovisual slide projectors remain expensive and are therefore beyond the reach of the average consumer.

However, technological advances and innovations are solving many problems and the day of the inexpensive "talking slides" is around the corner.

OBJECTS OF THE INVENTION

It is the principal object of the present invention to teach technically practical and economically feasible approaches and ways for solving several problems associated with audiovisual slides and audiovisual slide projectors.

It is a further object of the present invention to provide several novel forms of audiovisual slides, incorporating novel concepts of high-density information tracks of small or very small overall length, which may be scanned at slow or very slow speeds.

It is a further object of the present invention to provide audiovisual apparatuses accepting the novel audiovisual slides of the invention and to provide such apparatuses with means for effectively scanning the high-density information tracks at low velocities with excellent speed regulation.

Several other objects and advantages of the invention will appear and become evident from the ensuing description, illustrations and claims.

BRIEF DESCRIPTION OF THE FIGURES

FIGS. **1** to **7** and **11** are front views of audiovisual slides according to the invention.

FIG. **8** is a back view of an audiovisual slide according to the invention.

FIGS. **9** and **10** are exploded sectional views taken along line **9** — **9** of FIG. **8.**

FIG. **12** is a crossectional view of an alternative embodiment of an audiovisual slide according to the invention, taken along line **9** — **9** of FIG. **8.**

FIG. **13** is a partly sectional elevation of a simple audiovisual apparatus according to the invention, with some parts omitted to simplify the description.

FIG. **14** is a view taken along line **14** — **14** of FIG. **13,** illustrating an embodiment of a transducer transport mechanism, according to the invention, with some parts omitted.

FIG. **15** is a sectional view taken along line **15** — **15** of FIG. **14.**

FIG. **16** is another, similar to FIG. **15** sectional view, of another embodiment of a transducer-transport arrangement according to the invention.

FIGS. **17** and **19** are alternative different embodiments of transducer-transport mechanisms according to the invention, the views being similar to that of FIG. **14.**

FIG. **18** is a sectional view taken along line **18** — **18** of FIG. **17,** with some parts omitted to facilitate the description.

FIG. **20** is a simplified diagrammatic illustration of a special arrangement to insure positive tracking by the transducer.

FIG. **21** is a partly sectional elevation of a simplified diagrammatic illustration of an audiovisual apparatus according to the invention.

FIGS. **22** and **23** are sectional views of alternative component parts of apparatuses according to the invention.

FIG. **24** is an alternative embodiment of a transducer transport mechanism the view being equivalent to that illustrated in FIG. **14.**

FIG. **25** is a sectional view of a transducer-moving arrangement according to the invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

Phonographic records employ a spiral sound track. In order to retrieve the information therefrom, it is necessary to scan the sound track by means of a transducer which travels along the track and retrieves the information contained therein. The well-known practical method for achieving this is to place the phonographic record on a rotating turntable and the transducer on an appropriately designed arm. It is of course essential to maintain a constant, smooth and vibrationless rotating motion and this is usually achieved by placing the record on a rotating turntable. Since the moment of inertia of a rotating mass is a function of its weight and speed, the first turntables were heavy and were rotating at high velocity. But all other parameters being kept equal, the lower the scanning speed, the greater the

density of recorded information and the longer the "playing" time of a record. As technology advances, acceptable speed regulation can be maintained by lighter revolving masses and lower speeds. As the information-recording and retrieving technology advances, it becomes possible to store in and retrieve from a given area ever-increasing amounts of information.

In its prior inventions Dimitracopoulos taught methods whereby a spiral sound or information track, i.e., essentially along the phonographic principle, (but not necessarily phonographic but equally well magnetic or of any other type) was disposed around a transparency. In the special audiovisual reproduction apparatus the phonographic principle was inverted, the spiral sound track being kept stationery while the transducer was secured on a rotating member (for example an annular member) bearingly supported about the optical projection beam which was thus passing through the inner diameter of the turntable or the bearing. This arrangement permitted excellent information recording and reproduction, the principal problems being:

1. The design and manufacturing of smoothly turning bearings.
2. A standard 2 inches × 2 inches slide-mount, carrying a single or double-frame transparency, was insufficiently large to accommodate a sufficient length of sound track.
3. The centering of the sound track spiral with respect to the center of rotation of the transducers.

To solve the first problem, fairly heavy annular members (for example, transducers-carrying turntables) rotating at considerably high speeds were employed.

To solve the second problem it was necessary to mount the transparencies on fairly large and therefore nonstandard slide-mounts.

The third problem could only be solved by keeping strict manufacturing tolerances.

The instant invention, elegantly solves the above-stated, as well as several other problems.

Initially, phonographic records required a speed of 78 revolutions per minute. The standard speeds today have been reduced to 45 and 33 rpm. Sound movies employ sound tracks disposed at the edge of the film, which are photo-electrically or magnetically scanned at considerably high speeds. High scanning speeds imply that a considerable length of track is employed for any given portion of information or sound. In the phonographic art for example, half a revolution of a record is scanned in approximately one second and it is easy to realize that any sustained note will change pitch at the slightest eccentricity of the record, since such eccentricity will cause speed variations resulting in frequency changes. This phenomenon is commonly referred to as "wow." Likewise, any speed variations, for whatever reason, will cause equivalent problems.

Until recently, it was not practically feasible to obtain high density recording and reproduction of information from sound and information tracks. Therefore, as above explained, in his first audiovisual slides, the present inventor was forced to mount transparencies on larger than standard slide-mounts and was forced to employ scanning speeds comparable to those employed in the phonographic art. To aviod "wow" at these relatively high speeds, centering of the sound track was extremely critical and this in turn required very strict manufacturing tolerancies. Speed-regulation was also very critical and turntables (or annular rings) of fairly large masses were employed, which caused many problems, including difficulties associated with vibrating and unevenly turning bearings.

Almost all these problems can be eliminated or greatly reduced with high-density information tracks. To start with, if a circular or spiral sound track is scanned at a speed of, let us say, 1 revolution per 10 seconds, and this track is eccentrically placed, the eccentricity will of course cause variations of frequency, but since any sustained note is not likely to last more than a fraction of a second, or a second or two at most, the infinitesimal speed variation within this given time, will result in such a small change of frequency that it will pass undetected. At these very slow speeds, large-mass turntables are of no practical significance and therefore very light ones will perform just as well PROVIDING GOOD SPEED REGULATION IS MAINTAINED BY OTHER MEANS, AS IT WILL BE EXPLAINED BELOW. Finally, no serious bearing problems can be expected at these extremely low speeds. Therefore the present invention will teach:

1. Methods, means and arrangements for associating novel shapes, forms and configurations of high-density information tracks with projectable transparencies, even with projectable transparencies of very small size or utilizing very small-size slide-mounts, including standard-size slidemounts.
11. Methods, means and arrangements for scanning high-density sound tracks at very low velocities but with excellent speed regulation.

AUDIOVISUAL SLIDES

FIGS. **1** to **12** illustrate various embodiments of Audiovisual Slides according to the invention. Numeral **11** generally designates a transparency surrounded by area **15**, which may be an extension of the film itself or it may be a slide-mount, for example a standard 2 inches × 2 inches slide-mount. Numeral **17** generally designates a sound or information track.

By observing FIG. **7**, one may realize that a circle **17** can be inscribed on a standard 2 inches × 2 inches slide-mount **15**, surrounding a standard double-frame transparency **11**. But at a speed of 33 rpm, a playing time of 20 seconds requires a multiturn spiral of at least 11 turns (plus the expanded "lead-in" and "lead-out" turns) and this cannot be easily accommodated within the available space, not to mention that even an extremely small and compact transducer will obstruct the optical rays at the innermost grooves. Furthermore, as previously explained, the mechanical problems and the manufacturing tolerances preclude at such relatively high velocities a multiturn spiral on a small slide-mount, for example a 2 inches × 2 inches slidemount. But at very low speeds, a high-density information track, circular in shape as shown in FIG. **7** or having a few only revolutions as shown in FIG. **6**, is still entirely possible.

One might be tempted to dispose an essentially rectangular track around the transparency, but this configuration, as well as the priorly suggested by others zig-zag sound tracks, are entirely impractical, as at the corners there would be an abrupt change in direction and all such changes in direction imply infinite decelerations and accelerations of the scanning speeds, causing almost unsurmountable technical problems.

The present invention teaches forms of sound and information tracks having no such abrupt changes of di-

rection nor "corners." Accordingly to the present invention, the information tracks are placed adjacent to the image and are composed of a series of essentially linear and curved segments These configurations of information track had not occurred before as they were, and still are, meaningless and impractical without the transducer-scanning arrangements taught by the present invention and described in some detail below.

For example, the sound track **17** of FIG. **1** is composed of four, essentially linear segments and three curved segments and may be easily accommodated on the area **15** adjacent to the image or on the slide-frame **15** surrounding the transparency **11.** Furthermore, there being no "corners," such track **17** may be easily scanned by a transducer moving along at a slow and even speed, as it will be explained later.

There is an almost infinite number of ways to implement and reduce to practice the above-outlined principle of having "cornerless" tracks composed of a series of essentially linear and curved segments.

For example, the track may continue winding itself around the image, in any convenient number of turns, or fractions thereof, as illustrated in FIG. **2.** Alternatively, it may wind itself only in a fraction of a complete turn and, in the limit, it may be a straight line as illustrated in FIG. **3.** Equally well, it may wind itself along one only side of the frame (or area adjacent to the image), for example as shown in FIGS. **4** and **5.** (The number of "passes" not being confined to the illustrated examples, but to any number, as desired or convenient).

A single complete circle, optionally interrupted for start and finish points, is a very convenient form of track, as illustrated in FIG. **7.**

If the image is small, for example as small as the "pocket instamatic" transparencies, a spiral of a few only turns is quite adequate and can be easily accommodated around the image, as illustrated in FIG. **6.**

A very interesting novel arrangement will be described now, reference being made to FIGS. **8, 9, 10** and **12** (FIGS. **9** and **10** being exploded crossectional views of FIG. **8** taken along line **9 — 9**). Numeral **15** designates a typical slide-mount, for example a 2 inches × 2 inches slide-mount, carrying the usual transparency **11.** A metal, plastic, or cardboard cover **12,** optionally formed with flaps or sides **18,** is snuggly fitted over, or otherwise secured to, slide-mount **15** and has a light reflecting layer, or a mirror surface **14** directly facing at least the area of the transparency **11.** On its external (and opposite) surface, the cover **12** carries a sound or information track **17,** this track being of any convenient form or type, including, but not limited to, any of the forms and shapes described and illustrated in connection with FIGS. **1** through **7.** Optionally, at its center **13,** or at any other location, holes or depressions or indentations may conveniently exist in order to locate and align the track with the mecahnism of the scanning transducer. As an example, FIG. **8** illustrates a spiral track extending well over the area directly superimposed over the transparency **11,** while cylindrical depression **13** at the center of the track is employed for aligning the track with the scanning transducer mechanism. The flaps **18** are only a convenient method for securing the cover **12** over the slide-mount **15** and any other method for doing so is equally acceptable. For example, flaps **18** may be entirely omitted, in which case the cover **12** becomes a sheet or tablet which may be cemented or otherwise secured to slide-mount **15.** Equally well the slide-mount **15** may be optionally omitted altogether and the transparency **11** directly secured to sheet or tablet **12,** in which case the tablet **12** becomes a slide-mount and thus a cardboard, plastic, or metal slide-mount **12** may have a cross-section as illustrated in FIG. **12,** in which case, tablet, sheet or layer **81** carries the sound or information track on its external surface **83,** as above-described, and may also be formed with the locating hole or depression **13,** while tablet, sheet or layer **82** (formed with a "window" **85** to expose the transparency **11** to the projection beam) securely and fixedly holds the transparency **11,** in the usual slide-frame fashion. Between tablet **81** and transparency **11,** and at least in the area directly covered by this transparency, the light-reflecting layer or a mirror, is fixedly secured.

In any of the abovedescribed, in connection with FIGS. **8, 9, 10** and **12** audiovisual slides, a very fine Frensel Lens may be placed between the reflecting layer and the transparency, this lens being so fine in thickness that it cannot be shown in the crossectional illustrations.

In some cases, in order to better support the transparency **11** at the precise focal plane, it may be useful to place a thin spacer behind the light-reflecting layer and thereby bring it in direct contact with the transparency **11,** as shown by numeral **16** in FIG. **10.** This arrangement may be particularly useful when a cover or tablet **12** is secured over a transparency already mounted on a slide-frame. It is evident that since the transparency is backed-up by the light-reflecting layer or mirror **14** and the opaque table **12** behind it, none of the audiovisual slides illustrated in FIGS. **8, 9, 10** and **12** can be employed in a conventional slide projector and the special apparatus with which they can be used will be described in another section of the present disclosure.

It is also evident that any number of modifications, within the spirit of the invention, is possible and the types of cover **12,** layers or tablets, methods of securing these various layers to one another and to the transparency, light-reflecting layer and/or Fresnel lenses, may be modified as desired or convenient and the abovediscription and FIGS. **8, 9, 10** and **12** must only be considered as examples utilized to describe and illustrate the underlying principle of these arrangements.

FIG. **11** is an aperture card (that is a data-record card, or IBM card, with a transparency **11** mounted at an appropriate location) but also carrying one or more sound and information tracks **17.** Alternatively, FIG. **11** illustrates how the frame **15,** (or generally the area beyond the image **11**) may be extended in any desired direction in order to provide space for recording data, or other written or coded information, and also in order to extend the useful available space for disposing a larger portion of sound and information track **17** of any desired type or configuration.

Generally, it must be understood that any of the abovedescribed sound and information tracks may be employed with transparencies and optically reproduceable images of any type and size and with any type, size and form of frames or mounts and that any permutation and combination of images, tracks and frames are possible within the spirit of the invention, the illustrations of FIGS. **1** through **12** being employed purely as examples of the great number of possible alternatives.

Furthermore, the sound or information track may be of any desired or convenient type, such as phonographic, magnetic, optical or of any other type. Optionally there may be guiding tracks or grooves, either on the slides, or the slide-mounts, in order to guide the transducers along the desired paths, these guiding tracks or grooves being on the same or the opposite to the sound or informationtrack surface.

AUDIOVISUAL APPARATUSES

As abovestated, the abovedescribed forms of low-speed, high-density information tracks, are meaningless without a practical transducer-scanning arrangement providing acceptable levels of speed-regulation. Indeed without very strict speed-regulation of the scanning speeds, the sound quality will be intolerably poor. The instant invention provides practical solutions to this problem by actuating and/or controlling and/or regulating and/or assisting the relative motion between transducer and sound (or information) track by means of hydraulic means.

Again, the implementation or reduction to practice of the above-outlined principle, is possible in an almost infinite number of ways, and as an illustration, a simple embodiment will be now described, reference being made to FIGS. **13, 14** and **15.**

Numeral **56** designates the housing or frame of an audio-visual slide projector, according to the invention, including a projection lamp **51,** held in socket **52,** attached to bracket **53** which is fixedly disposed on frame or housing **56.** By means of appropriate positioning members, for example members **54** and **55,** a slide-mount **15** is inserted and held stationary at the desired focal plane of the apparatus, so that the light emitted by lamp **51,** passing through transparency **11,** forms imaging rays, which are focussed by projection lens **50,** onto a viewing screen or projection screen (not shown), the axis of the projection beam being designated by line X – Y.

Adjacent to and substantially facing the sound track **17** (on slide-mount **15**), is transducer-guiding member **21,** which is fixedly secured to support **57,** attached to frame **56.** Support **57** is formed with an opening or window **58** allowing free passage of the imaging rays. Transducer-guiding member **21** carries slidably a transducer **23,** which follows the sound or information track in an information scanning and retrieving relationship.

The transducer-guiding member **21** may be better described by reference to FIG. **14,** which is a view taken along plane **14** — —of FIG. **13,** with some parts omitted and the audiovisual slide is shown in dotted lines to simplify the illustration and the ensuing description. Purely as an example, the audiovisual slide of FIG. **1** is shown in FIG. **14.** It will be noted that the guiding member **21,** not only faces the sound or information track, but is substantially of the same shape and being exactly superimposed on it, hides it completely from view.

The guiding member **21** may have any convenient cross-section but let us assume that it is tubular in form, essentially as shown in FIG. **15,** and that it slidably supports carriage **23'**, on which transducer **23** is secured, so that carriage **23'** may freely and smoothly slide along the entire length of guiding member **21.** The guiding member **21** is fixedly secured to support **57** by any convenient means, for example by brackets **28** and **29.**

It is necessary to smoothly move carriage **23'** and transducer **23,** and this may be conveniently accomplished by flexible plunger **25** which freely but snuggly passes inside guiding-member **21,** its end secured to carriage **23'**, for example by means of bracket **34** (see FIG. **15**), and for this purpose guiding-member **21** is provided with a length-wise slit **22.**

The other end of flexible member **25** may be attached to the piston of dashpot **27** or any other motion-supplying machanism, but preferably a hydraulic, or hydraulically actuated, assisted, controlled or regulated mechanism, which imparts a smooth, constant and linear motion to the flexible member **25.** In this manner, the transducer **23** will move along, follow and scan the information track **17,** regardless of the actual shape of this track, the only requirement being that the guiding member **21** be of such shape and contour that it forces the transducer to follow the desired path. An additional requirement is - of course - that there should be no abrupt changes in direction (or "corners") in the information track, since such "corners" cannot be easily negotiated by the traveling carriage **23'**.

The guiding member **21** will have a shape compatible with the information track it is designed to be used with. Thus, while in FIG. **14** the shape of guiding member **21** is compatible for use with the slide of FIG. **1,** other shapes, closely following (and/or compatible with) the shapes of the information tracks of FIGS. **2** through **12** will be used, as the case requires.

The guiding member **21** may also have any desired crossection, not limited to the abovedescribed circular one. Nor does it have to be hollow, but may be solid, for example as illustrated in FIG. **16,** in which case it may be secured along all (or part of) its length to support **57,** for example by means of bracket **35,** and the carriage **23'** will be, of course, of an appropriate shape. In this case, the guiding member **21** being solid, a wire or strap may be employed (instead of flexible plunger **25**), which wire or strap is wound or strapped around the guiding member **21,** one of its ends being secured to carriage **23'** and the other to a dashpot or other hydraulic or non-hydraulic, motion supplying means, as will be described below in connection with FIGS. **17** and **18.**

It is evident that the guiding member **21** may also be a cut-out, or furrow, formed in the support plate **57.** Evidently the flexible member **25,** instead of pushing the transducer carriage **23'**, could equally well pull it, as a matter of fact, when this flexible member becomes a strap or wire, pulling a better arrangement since flexible members of small cross-section (such as wires or straps) are better suited to operate in tension rather than in compression.

FIGS. **17** and **18** illustrate an alternative embodiment in which the guiding member **21,** may accept a flexible member **62** (for example a wire or strap) wound or strapped around it, and for this purpose it may be formed (as shown in FIG. **18**) with a groove or track **67** containing and guiding such wire or strap. Such wire or strap may then be pulled by a dashpot arrangement as described in conjunction with FIG. **14,** or in any other convenient manner, or the wire or strap may be of an endless type **62** (for example a belt) which, after winding around the guiding member **21** wraps itself around wheel, disc or cylinder **61.**

Guiding rollers or guides (such as those denoted by numeral **66**) will be useful to guide belt **62** along such desired path. Wheel **61** may be smoothly rotated about its center **63** and will thus move the transducer along

the guiding member **21**. Wheel **61** may be rotated in any suitable way but since smooth rotation is essential, this motion may be conveniently actuated, assisted, controlled or regulated by hydraulic means.

For moving the transducer along circular or spiral information tracks, such as those illustrated in FIGS. **6**, 7, and **8**, another alternative embodiment may also be used, such alternative embodiment being illustrated in FIG. **19** in which: An annular member **71** is rotatably supported on support **57** (same support **57** as that shown in FIG. **13**, the annular member **71** taking the place of the guiding member **21**). A wire, strap or equivalent flexible member may be wound a few turns around the circumference of the annular member (or around any other convenient circular path, concentric to its center of rotation), and one of its ends is attached to the piston of a dashpot (or equivalent mechanical or hydraulic mechanism) and its other end is attached to a spring **73**, the other end of the spring being secured on the frame **74** of the projector or to any other fixed location.

A transducer **23** is mounted on an appropriated arm, or on a sliding carriage, which is mounted on the annular member **71**, so that the transducer **23** may freely move along a radial (to the annular member) path.

The annular member **71** has a window **76** at its center to allow free, unimpeded, passage to the projection beam. The transducer engages the information track and, as the annular member slowly rotates, it moves the transducer along the information track in an information-scanning relationship.

FIG. **21** illustrates in a simplified and somewhat diagrammatic fashion one of the possible alternative embodiments of audiovisual apparatus employing audiovisual slides of the type shown in FIGS. **8, 9, 10** and **12**. The audiovisual slide is placed in the "playing" position of the apparatus and is aligned by means of spindle **46** engaging hole or deperssion **13**.

Rotatable member, for example an annular disc or turntable **45** carrying transducer **23** on an appropriate bracket or arm, rotates about spindle **46** and thus progressively moves transducer **23** along the information track **17**, in an information scanning relationship. An optical projection beam is directed along path AB, where it is deflected by prism or semi-transparent mirror **49** in the direction BC. Reflecting sufrace **14** reflects the beam back and after emerging from B it passes through an appropriated proojection lens **50** in the direction D. Evidently, in following this path the beam passes through the transparency and is light-modulated so that imaging rays may be focussed by projection lens **50** onto a viewing or projection screen (not shown).

If the sound and information track on the auidovisual track is a multiturn, high-velocity one, a turntable of substantial mass may be convenient in order to impart the necessary rotational inertia and thereby insure smooth and even rotating velocities and, in this case, conventional turntable mechanisms may be employed for this purpose. On the other hand when a single turn circular track is employed, such as that illustrated in FIG. 7, or a spiral track of a few only turns as illustrated in FIGS. **6** and **8**, and, in particular, when a LOW-VELOCITY track is utilized, it will be convenient and advantageous to employ any of the abovedescribed arrangements for slowly moving a transducer, including the hydraulic and hydraulically controlled and assisted ones.

NOTES AND COMMENTS

The abovedescribed alternative, transducer-moving, arrangements and audiovisual apparatuses and parts thereof are only examples of the several possibilities existing, within the spirit of the invention, for slowly moving transducers in a smooth and vibrationless fashion along the low-velocity, high-density, information tracks. It is evident that while the transducers and the transducer-moving systems are shown (see FIG. **13**) as being disposed between the transparency and the projection lens, they cound equally well be disposed on the other side of the transparency, i.e., on the illumination-source side.

The plane of the audiovisual slide in the audiovisual apparatus may be vertical, horizontal or at any convenient inclination.

The transducer itself may be of any convenient and desired type, consistant with the sound or information track it is designed to scan. Thus, the sound or information track may be phonographic, magnetic, optical, or of any desired and convenient type. Optionally there may be guiding grooves on the slides or slide-frame surface for guiding the transducer along the desired paths, in which case it might be desirable to provide some "play" between the carriage member ' and the transducer **23**.

Finally, in order to ensure good seating of the transducer tip on the information tracks, the carriage member **23'** may carry a pincers - like member, for example as designated by numeral **31** in FIG. **20**, having the transducer **23** and a pad **32** facing one another and pressing against two opposite surfaces of slide **15**. Optionally again, a pad **32** may carry a tip or stylus **33** engaging and following an unmodulated groove on the opposite to the information track surface, so that while sytlus **33** follows the groove, it guides transducer **23** along the desired path of the information track.

Any of the above-disclosed apparatuses and parts thereof may be employed in conjunction with appropriate and desirable optical, elecrical, electronic and mechanical means (for example, slide-changing means) such as, but not exclusively, those disclosed in the several prior patents by the same inventor.

Appropriate housings will enclose and protect the apparatuses.

Other than visible or recognizable by the naked eye images may be employed with the slides and apparatuses (for example, invisible frequencies, holographic or coded information) and in such instances, appropriated modifications will be made, within the spirit of the invention.

While the principles underlying the embodiment illustrated in FIG. **19** were abovedescribed, some further elaboration might be in order and this can be better accomplished by also referring to FIG. **22** which is a cross-section taken along a diameter of the annular member **71** and its support **57**, such support **57** being equivalent to that illustrated in FIG. **13**. In this case, the support **57** is formed with (or has secured on it) a tubular member **75** which bearingly and rotatably supports annular member **71**, carying transducer **23** in any appropriate bracket, for example arm **81** pivoted about shaft or pivot **82** secured to annular member **71**. The optical beam freely passes through opening or window

76, as previously noted. An alternative arrangement for carrying transducer 23 is illustrated in FIG. 19, the transducer assembly being shown in dotted lines since the illustration is equivalent to a view taken along line 14 — 14 of FIG. 13. Thus the transducer 23 may be secured to carriage 91 which is slidably supported for radial (to the annular member) movement, along shafts 92 and 93, which are fixedly secured to the annular member 71, in any appropriate way (not shown).

It is evident that the above-described transducer-carrying arrangement could equally well be employed in the embodiment illustrated in FIG. 21, in which the transducer 23 is secured to arm 81, pivoted about pivot 82, secured to rotating member (for example turntable) 45.

Any alternative transducer-carrying arrangement may be used as dictated by technical and economic considerations.

The arrangement illustrated in FIG. 24, in almost all respects, similar to that of FIG. 14, except that guiding member 21 is hollow and leak-proof. Tubes 125 and 126 are attached to member 21 and are in fluid-communication with it, and also with hydraulic pump 127. Thus an appropriate fluid, for example silicon fluid, can be circulated through members 125, 21, 126 and pump 127 and by any convenient arrangement may smoothly move transducer 23 along guide-member 21.

Again there is a large number of choices for coupling the movement of fluid inside guide-member 21 with the transducer 23 (or its carriage 23'). Therefore, purely as an example, the following arrangement will be described in connection with the crossectional illustration of FIG. 25, showing an enlarged segment of guide-member 21 filled with fluid.

Numeral 135 denotes a plug of magnetic material which has well-defined North-South magnetic regions, for example as illustrated, slidably moves inside guide-member 21. Carriage 23', carrying transducer 23, smoothly slides in the previously described manner over member 21. Carriage 23' is also formed with well-defined North-South magnetic poles and is thus magnetically coupled to plug 135. It is now evident that as the hydraulic pump 127 circulates fluid inside guide-member 21, the plug will move and will magnetically pull carriage 23'. To prevent leakages between the plug 135 and the guide-member 21, "O-rings," "Rulon rings," or any other convenient type of seal may be employed, for example rings 136 and 137. An oil-impregnated felt 138, or other equivalent substance or arrangement may be placed under carriage 23' to assist smooth movement.

It has already been noted that the guiding member 21 does not have to be necessarily a separate and distinct part, such as that denoted by numeral 21 in FIG. 13. It can equally well be a cut-out, or furrow, or appropriately shaped depression, formed in a plate or equivalent member, for example in the support plate 57 (see FIG. 13), in which case this arrangement may be as illustrated in the cross-sectional view or FIG. 23, where numeral 57 again denotes a support plate equivalent to the support plate 57 or FIG. 13. The guiding member 21 (see FIG. 23) is shown as a cut-out formed in plate 57, inside which any of the previously described plungers, flexible members, fluid circulating arrangements, etc. may be employed and which may also conveniently contain, support and guide the carriage 23' and transducer 23.

In general, while a number of specific embodiments of apparatuses, slides and components have been disclosed herein, it will be understood that modifications and variations are possible within the spirit of the invention and may indeed occur to those skilled in the art and therefore it is not intended to exclude such variations and modifications.

It must be understood that parts, or combination of parts, described in conjunction with one embodiment, or in conjunction with one specific illustration may be used in conjunction with another embodiment or other illustration. For example, a flexible member 25, as described in conjunction with the embodiment of FIG. 14, may be used to rotate the annular member 71, in which case this flexible member 25 will be wrapped around the circumference of the annular member 71 or around any other convenient circular path, concentric to its center of rotation. As a further example, the wire, strap or flexible member, employed to rotate annular member 71 may equally well be wound around guiding member 21, of FIG. 17 (or in furrow or channel 21 of FIG. 23) and its free end attached to a dashpot or equivalent hydraulic or mechanical mechanism, such as that employed with the embodiment of FIG. 19.

As a further example of possible alternatives, all within the spirit of the invention, it is not mandatory to employ one single wire, strap or equivalent flexible member, in conjunction with the embodiment of FIG. 19 but, equally well, one wire, strap or flexible member may be attached to dashpot 27 and another wire, strap or flexible member, to spring 73. (their other ends being attached to member 71). In the final analysis, spring 73 is not absolutely essential, although it is convenient to employ a spring, or equivalent mechanism or part, which exerts a spring-like action.

What is claimed is:

1. Means to reproduce and project audiovisual information comprising:
   a. support means for fixedly holding an audiovisual record having a projectable image and an information track,
   b. optical projection means directed onto said image,
   c. rail guiding means facing said track and enantiomorphically following the geometric configuration of said track,
   d. a transducer slidably supported by said rail means and cooperable with said track,
   e. moving means for moving said transducer along said rail means and thus carrying said transducer progressively along and in an information-scanning relation to said track.

2. Means to reproduce and project audiovisual information according to claim 1, wherein said rail means is a hollow member in fluid communication with hydraulic pump means.

3. Means to reproduce and project audiovisual information according to claim 1, wherein said moving means include hydraulic means actuating a flexible member cooperable with said rail means.

4. Means to reproduce and project audiovisual information according to claim 1, wherein said moving means include a flexible member forming an endless loop following said rail means and also winding itself around a wheel.

5. Means to reproduce and project audiovisual information according to claim 1, wherein said rail means is a hollow depression formed in a plate member.

6. Means to simultaneously reproduce and project audiovisual information comprising:
a. support means for fixedly holding an audiovisual record having a projectable image and an information track,
b. optical projection means directed onto said image,
c. an annular member rotatably mounted adjacent said support means for rotation about its center of rotation,
d. a transducer secured to said annular member and cooperable with said track,
e. a flexible member wrapped about a circular path on said annular member, one end of said flexible member secured to spring means, the other end of said flexible member being secured to moving means, said moving means moving said flexible member against the force of said spring means thereby smoothly rotating said annular member and carrying said transducer progressively along and in an information-scanning relation to said track.

7. In combination, an audiovisual apparatus accepting an audiovisual slide-mount; said slide-mount comprising a base member having on one side a hole coaxially surrounded by an information track, a light-reflecting layer on the other side, and a frame member framing and holding a projectable transparency in an overlaying relation to said layer; said apparatus having:
a. seat means for fixedly holding said slide-mount,
b. a rotating transducer scanning said information track,
c. shaft means supporting said transducer for rotation, said shaft means entering and engaging said hole thus aligning said rotating transducer with said track,
d. a radiation beam passing through said transparency and reflected by said layer back through said transparency to retrieve the imaging information contained therein.

8. In an audiovisual apparatus accepting for reproduction an audiovisual record having an image and an information track:
a. support means for fixedly holding said record,
b. hollow tube means having a fluid therein,
c. plunger means moving in said tube means in piston-like fashion,
d. a carriage slidably disposed on said tube means and magnetically coupled to said plunger means,
e. a transducer mounted on said carriage, said transducer being cooperable with said track,
f. fluid-moving means connected to said tube means to move said fluid in said tube means and thereby said plunger means and thereby said carriage, and thus carry said transducer progressively along and in an information scanning relation to said track.

9. In an audiovisual apparatus accepting for reproduction an audiovisual record having an image and an information track:
a. support means for fixedly holding said record,
b. hollow tube means having a lengthwise open slit,
c. a carriage slidably disposed on said tube means,
d. a transducer secured to said carriage, said transducer being cooperable with said track,
e. plunger means freely movable inside said tube means,
f. coupling means passing through said slit, thereby coupling said carriage to said plunger means,
g. moving means imparting a motion to said plunger means and thereby to said carriage, and thus carrying said transducer progressively along and in an information scanning relation to said track.

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