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(54) Display devices and display drives; game machines incorporating them

(57) A drive for a game machine display, particularly suited for a game like roulette, uses a single stepping motor (1) to drive two different rotating display elements (9,6). A drive mechanism (5) has two different drive trains from the stepping motor (1). Their outputs contrarotate coaxially, and differ in drive ratio so that a marker (81) can be superimposed on any segment (75) of a sub-divided wheel element.

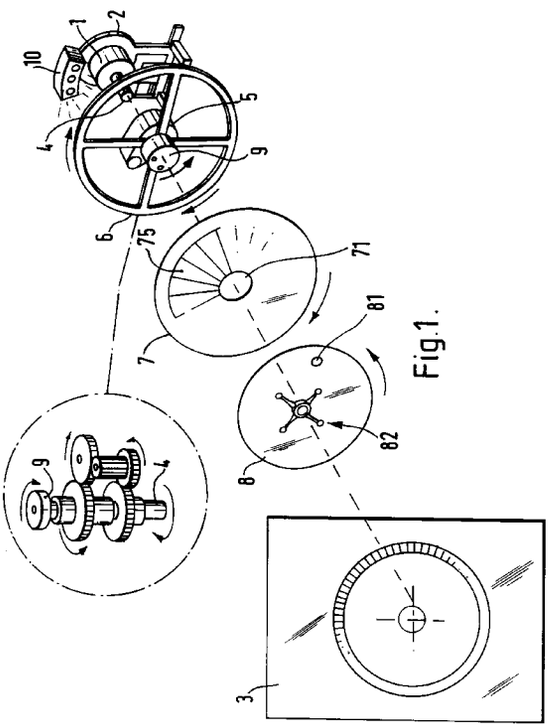

Fig.1.

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Description

This specification is concerned with moveable displays for electrically-driven game machines and means for driving such displays. It relates also to game machines having such displays and drives, particularly but not exclusively coin-freed or other credit-freed game machines.

A general aim in one aspect is the provision of a new kind of drive for providing an automated display involving relatively rotatable display elements, e.g. suitable for use in simulating roulette, a "wheel of fortune" or the like.

Roulette simulation has been done previously. US-A-3819186 describes a purely electronic simulation using a fixed display backdrop in the form of a ring subdivided into numbered segments, each segment having an indicator light. Circuitry is provided to give a sequenced flashing of the lights around the ring as a substitute for the rotation of a ball. DE-A-3812975 describes a roulette simulation using a representation of a roulette wheel and a radial finger carrying a mock ball. These are driven by respective stepping motors.

What we now propose is a game machine display drive mechanism comprising:

a common rotational input to receive drive from a drive motor;

a first rotational display output connected to be driven from the common input through a first drive train, and

a second rotational display output connected to be driven from the common input through a second drive train.

The first and second drive trains preferably differ, so as to produce different rotational behaviour of the first and second display outputs despite the common drive.

The display outputs may be axially parallel, and in particular they may be coaxial. To achieve the latter, the second display output can rotate with a sleeve assembly around a shaft of the first drive train.

It should be understood that one of the drive trains may be a simple direct drive, but one or both may involve a gear train.

The first and second drive trains may be designed so as to produce opposite senses of rotation for the first and second display outputs. This of course is appropriate when a roulette-type game is to be created.

Furthermore, the drive ratios of the first and second trains are preferably different, to give different degrees of rotation of the respective display outputs for a given rotation of the input. This may be purely for visual effect but more particularly may be to achieve variation in the relationship between the first and second displays. In a preferred display a display element rotating with one of the display outputs is divided into display segments (e.g. divided around its circumference, as in a roulette wheel or wheel of fortune) while the other display element has some circumferentially localised marker (such as a representation of a ball or peg) to indicate a game outcome by registration with a segment of the other display element. By providing appropriately varied drive ratios for the two trains, the full range of outcomes can be made available.

In use, means are provided for driving rotation of the common drive input. The drive is preferably adapted to drive as a limited episode or "spin" in response to some appropriate starting signal e.g. input by a player. The stopping position at the end of the spin may be determined on the basis of random or quasi-random selection generated by a control unit. Means for doing this are well known for the control of display wheels in fruit machines.

The drive described herein is particularly suited for use with a stepping motor, which is the conventional drive source in many games machines. The present proposals enable the use of a single stepping motor to give a wide variety of possible display interactions. The use of differing drive ratios is implemented with a stepping motor, giving a full range of relative rotational orientations in the "stopped" condition so that the use of a common drive for the two elements does not inordinately reduce the number of possible outcomes available for random/quasi-random selection. For example, the ratios may differ so that a single rotation of a display marker about the axis corresponds to a rotation of the other display element differing by the angle of one segment from a single rotation (or from multiple full rotations, or a simple fraction of a full rotation).

The display elements may be superimposed, and may take the form of layers or discs. The front element is preferably see-through e.g. a transparent layer of plastics material which is suitable also from the manufacturing aspect since it lends itself easily to the use of image application techniques routinely available to game machine manufacturers.

Implementation of these displays in a game machine may typically involve means for generating the random or quasi-random value, means for sending a rotation instruction to the drive on the basis of that value, means for signalling a characteristic value or identity corresponding to a relative orientation of the first and second display segments, e.g. the identity of a segment indicated by a marker, when the rotation ceases, means for a player to input a guessed identity or characteristic that will be indicated when the rotation ceases, and means for comparing the guessed and actual/signalled identities or characteristics and issuing a game award if they coincide. These may be the conventional game awards e.g. further play credits, money, tokens or the like.

Means may also be provided for inputting a stake e.g. as a variable amount, associated with the guessed identity or characteristic, e.g. to simulate the betting in a game of roulette.

Another possibility is to use, either instead of or additionally to the automatically-controlled stopping of rotation, a player-operated means for causing or initiating a stop of the display rotation. This can be used to introduce a skill factor into the game.

A display of this type may be used to constitute a machine game in its own right. Alternatively, the machine may be a fruit machine i.e. a machine having a plurality of display reels arranged side-by-side, each reel having a circumferential series of symbols and means being provided to run a game in which the reels are spun (or a video simulation of reels appears to spin), the game outcome depending on the symbols of the various reels that are aligned with a win line or win region after the spin. This is well known. Operation of the present display, e.g. a roulette display, may then be provided as a "feature" of the fruit machine i.e. the opportunity for playing the special display being awarded only for certain outcomes of the reels game of the fruit machine. The present display might conveniently be provided face-on to the player behind the machine fascia e.g. above the reels.

Some specific proposals are described, with reference to the accompanying drawings in which:

Figure 1 shows, in exploded perspective view, a schematic set-up for a roulette display in a game machine;

Figure 2 is a schematic face-on view of a ball display element superimposed on a roulette wheel display element, and

Figure 3(a) shows in schematic axial cross-section a drive mechanism for driving the display, Fig. 3(b) being an end view of the drive mechanism.

Fig. 1 shows how the concept explained above can be implemented behind the glass in a fruit machine. A stepping motor 1 is mounted on a bracket 2 behind the machine glass 3, with its shaft 4 facing forwards towards the glass, and is connected to a drive mechanism 5. The drive mechanism 5 has two coaxial outputs, as described below in more detail.

The output nearest the motor 1 drives a wheel support frame 6, here in the form of a spoked annulus, on which is fixed a roulette wheel display disc 7. This is a flat circular polymeric transparency, with a central hole 71, around which by standard printing techniques a series of wheel segments 75 is displayed.

A front display disc 8, formed of the same materials and in the same way as the wheel display disc 7, is positioned coaxially in front of the wheel display disc 7 and rotated by the second of the two drive outputs. The display on the front disc 8 includes a peripherally-positioned representation 81 of a roulette ball, and a central representation 82 of a manual spinner grip. The later may be omitted, or represented on the front glass 3 of the machine, or on the rear disc. The front drive output of the drive mechanism 5 has a flat plate 9 to which the front display disc 8 is secured.

Behind a top peripheral part of the display is positioned a light 10 to indicate (as explained below) the winning segment in each case.

The drive mechanism may have general features as follows. See Fig. 3. The drive shaft 4 from the motor is fast with a main drive gear 41. The main drive gear 41 is offset from the main axis 40 of the display apparatus. A main stub shaft 91 extends along this main axis 40, and carries at its inner end a ball drive gear 92 meshing with the main drive gear 41. Thus, rotation of the main drive gear drives the stub shaft 91 in rotation, rotating also the support plate 9 fixed to its end and the front disc 8 fixed to that.

The support frame 6 for the rear disc 7 is part of an outer sleeve assembly 71 rotatably journalled around the central stub shaft 91 by any appropriate bearings as known to the skilled person. The sleeve assembly 71 includes a wheel drive gear 72, positioned coaxially in front of the ball drive gear 92. The main drive gear 41 engages a planetary idler gear 110 which meshes with the wheel drive gear 72. Thus, rotation of the main drive gear 51 drives also rotation of the sleeve assembly 71 and thus of the rear disc 7. Because of the intervening idler gear 110 the two discs are driven in opposite senses.

Fig. 2 indicates schematically the arrangement of segments 72 displayed on the rear disc 7. In this particular embodiment, the aim is to achieve convenient operability with a 48-step stepping motor, which is a type conventionally used in the construction of game machines. It will be understood by the skilled reader that, should other stepping motors be or become conveniently available, the present concepts can easily be adapted to them. In the present case, because the motor has 48 steps, a roulette wheel display having twelve segments 72 is chosen. Displays having sixteen or twenty-four segments would do as well.

Any method of visually identifying the segments may be used. We prefer to number them, as in conventional roulette, but other symbols or distinctive patterns or colours could be used instead.

With twelve segments, each segment represents 30° of angle, four steps of the stepping motor. To achieve a simple operation, this embodiment stops the ball representation 81 always at the top centre position of display, in front of the illuminating light 10. This being so, it is of course crucial that the wheel display 7,72 be rotated with some difference in the manner of rotation from the ball display, otherwise the same segment will be indicated every time. Various ways of doing this may be contemplated, but for simplicity we have chosen to drive both displays from the same stepping motor and employ different gearings for the two drives. In particular, we note that if for one turn of the "ball" the wheel display 72 rotates by an amount differing by the angle of one segment (30°) from a full rotation, then potential superimposition of the ball 81 on all of the segments 72 will be available as rotation progresses. This is why in this embodiment we choose a segment angle that can be exactly provided by the stepping motor. To arrange that the wheel 7 turns one segment further than one rotation, an excess rotation of 30° must be provided, i.e. 390° rotation of the rear

disc 7 for every 360° rotation of the front disc 8. The ratio 390/360 reduces to 13/12, and the drive ratio of the rear disc 7 to that of the front disc 8 is chosen accordingly. For example, we can use a 1:1 drive from the main drive gear 41 to the ball drive gear 92, and a 13:12 drive from the main drive gear 41 to the wheel drive gear 72. In the illustrated embodiment, the main drive gear 41 and ball drive gear 92 each have 26 teeth and the wheel drive gear 72 has 24 teeth.

In operation, a player inserts a guessed outcome of the spin (by means not shown) which is noted by the machine control unit. The machine control unit generates a random or quasi-random value (in known manner) to select a number of full rotations of the front disc 8. The front disc 8 makes those rotations, ending with the representation of the ball 81 at top centre. The segment beneath the ball will vary according to how many rotations have been made. The light 10 behind illuminates the winning segment. This is for display purposes. As with a conventional fruit machine reel, the control unit in fact already knows (from the generated random/quasi-random value) the identity of the "winning" segment and whether it matches that guessed by the player. An award is calculated on the basis of the comparison in the usual way, and indicated to the player when the spin is complete.

Claims

1. A game machine display drive mechanism comprising:

   a common rotational input (4) to receive drive from a drive motor (1);

   a first rotational display output (9) connected to be driven from the common input (4) through a first drive train (41,92,91); and

   a second rotational display output (6) connected to be driven from the common input (4) through a second drive train (41,110,72).

2. A drive mechanism according to claim 1 in which the first and second display outputs (9,6) are coaxial, the second drive train comprises a sleeve assembly (71) rotatable around a shaft (91) of the first drive train coaxial with the first display output, the first and second drive trains produce opposite senses of rotation for the first and second display outputs (9,6), and the drive ratios of the first and second drive trains differ to produce different speeds of rotation for the first and second display outputs (9,6).

3. A drive mechanism according to claim 2 further comprising the drive motor (1) which is a stepping motor.

4. A game machine display comprising first and second rotatable display elements (8,7) secured to the first and second display outputs (9,6) of a drive mechanism according to claim 3, one of the display elements (7) being divided into a plurality of display segments (75) and the other display element (8) having a circumferentially localised marker (81) for selectively indicating a said display segment (75) by superimposition.

5. A game machine comprising a display according to claim 4.

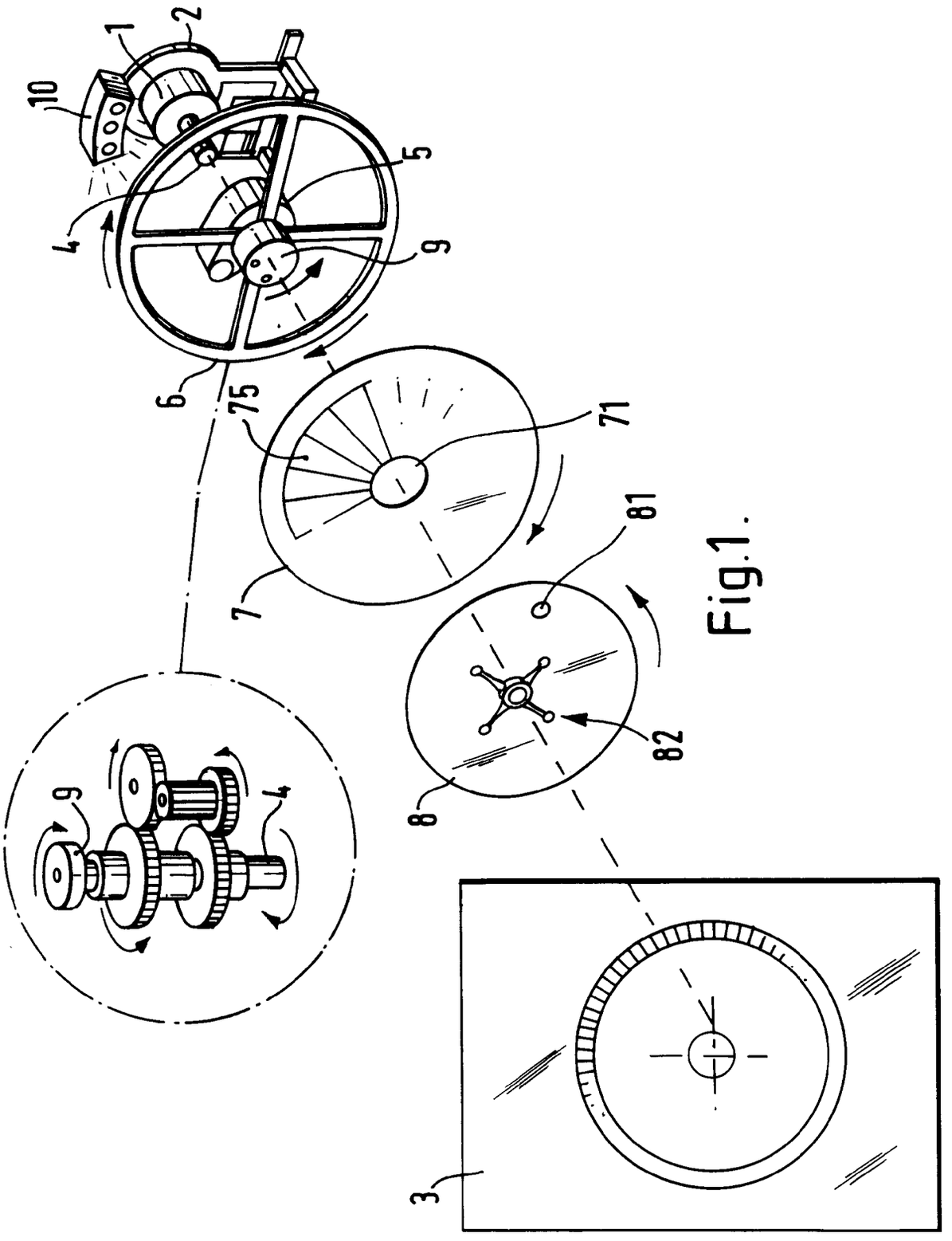

Fig.1.

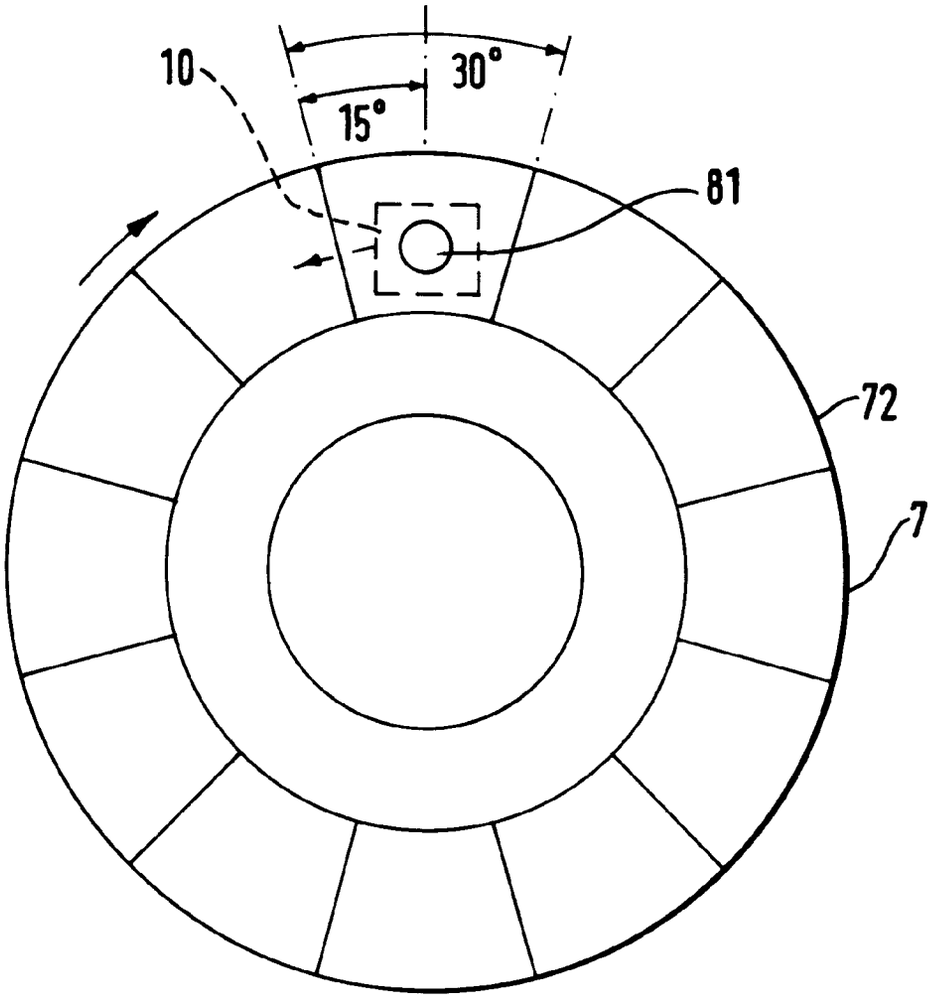

Fig.2.

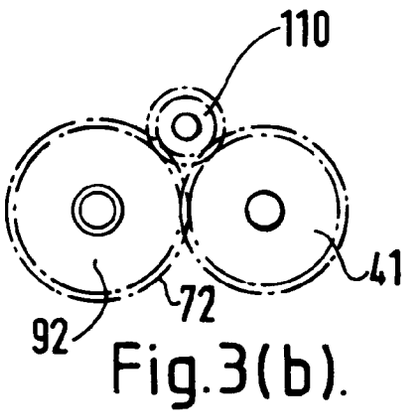

Fig.3(b).

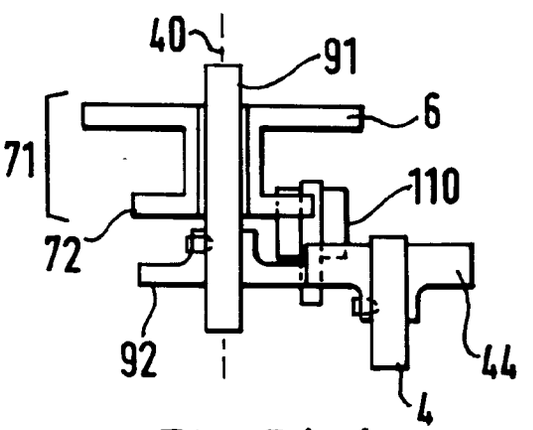

Fig.3(a).

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EUROPEAN SEARCH REPORT

Application Number
EP 95 30 4679

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y A	DE-B-29 09 527 (K.M. IMMENDORF) * claims 1-5,12; figures 1-3 * * column 5, line 10 - column 6, line 17 *	1,4,5 2	G07F17/34 A63F5/00
Y A	DE-A-38 12 975 (ELECTRON GAMES) * abstract; claims; figures *	1,4,5 3	
A	DE-A-37 36 770 (J. PEITZ)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

G07F
A63F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 October 1995	David, J

CATEGORY OF CITED DOCUMENTS

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