

the alignment of the symbols in the respective image regions. Figure 16 shows the normalized, i.e. rotated and scaled, image regions with the symbols. Figure 16a shows the image regions represented in Figure 16 after a threshold operation. ~~Figure 17 shows the display content of a terminal, the symbols ascertained and passed on to the OCR algorithm.~~ Figure ~~18-17~~ shows the display content of a terminal for a player during the phase of placing bets. Figure ~~19-18~~ shows the display content of the terminal during the draw. Figure ~~20-19~~ shows the display content of the terminal in the case of a win. Figure ~~21-20~~ shows the user interface for the game operator.

15 **Description of a preferred embodiment of the invention**

Figure 1 shows an automatic ball drawing machine 1 for drawing balls 2 for a bingo game. The present case concerns an automatic unit 1 with a base 34 and an automatic ball drawing machine 1 mounted on the base 34. Arranged around the automatic ball drawing machine 1 is a spherical glass enclosure as a covering 350, which prevents a player from having direct access to the automatic ball drawing machine 1. In the present case, the glass enclosure is formed as transparent. This has the advantage in particular that the automatic ball drawing machine 1 with the automatic unit can be set up or arranged centrally in rooms and that individual players can take up positions around the automatic unit 1. Alternatively, the glass enclosure 350 may also be formed as at least partially opaque or non-transparent, advantageously with an unobstructed view of the main parts of the automatic gaming machine.

35 In the present case, this covering 350 is formed as spherical, but, on the basis of its main purpose, that of protecting the automatic ball drawing machine 1 from access by players, any other desired form may be

CLAIMS:

1. ~~A method for identifying a selected playing ball (2) from a prescribed number of playing balls (2), each of the playing balls (2) being respectively provided with symbols that differ from the other playing balls (2),~~
- 5 ~~a) wherein the selected playing ball (2) is moved from a starting position (422) through the recording area of an image recording unit (3),~~
- 10 ~~b) wherein the center of mass (M) of the depiction of the selected playing ball (2) in the image (300) of the image recording device (3) is kept unchanged for a prescribed period of time and does not undergo a relative movement in relation to the image (300),~~
- 15 ~~c) wherein the image position and the size of the depiction of the playing ball (2) are ascertained, and a check is performed to determine whether parts of the depiction of the playing ball (2) are situated outside a lateral edge prescribed beforehand in relation to the image (300), and~~
- 20 ~~d) if parts of the depiction (35) of the playing ball (2) are situated outside this lateral edge, the playing ball (2) is returned to the recording area of the image recording unit (3) and/or is repositioned and steps b) to d) are repeated, and~~
- 25 ~~e) at least one image (300) recorded by the image recording unit (3) is taken as a basis for carrying out a method of identification and ascertaining an identification result that corresponds to or is clearly assigned to the symbol on the surface of the selected playing ball (2).~~
- 30
- 35 2. ~~The method as claimed in claim 1, characterized in that, to establish the center of mass of the depiction of the selected playing ball (2) in the image (300) of the image recording unit (3), the~~

~~playing ball (2) is stopped and remains unmoved in relation to the image recording unit (3).~~

5 ~~3. The method as claimed in claim 1 or 2, characterized in that the playing ball (2) is moved by means of a ball guiding unit (4) from the starting position (41) along a prescribed path (42) through the recording area of the image recording unit (3), the respective selected playing ball (2) being removed from the ball guiding unit (4) after it has moved over the prescribed path (42), and passed on if appropriate.~~

10

15 ~~4. The method as claimed in claim 3, characterized in that the selected playing ball (2) is advanced on the prescribed path (42) in the form of an arc of a circle on a horizontal plane, the recording direction or the line of sight of the image recording unit (3) running substantially horizontally and preferably being directed to a point on the prescribed path (42) at which the playing ball (2) is closest to the image recording unit (3).~~

20

25 ~~5. The method as claimed in either of claims 3 and 4, characterized in that the playing ball (2) is received by a circular clearance (44) of the ball guiding unit (4), which is of a substantially flat and disk shaped form, and is secured against laterally rolling away, wherein~~

30

~~— a) the playing ball (2) is thrown or falls into or onto the circular clearance (44) from above, and the fall of the playing ball (2) preferably being slowed down, in particular by an elastic damping unit (47) located underneath the clearance (44), and/or~~

35

~~— b) the playing ball (2) is guided and/or rotated in the clearance (44) of the ball guiding unit (4) and~~

~~is supported on a base plate (45) located underneath the disk shaped ball guiding unit (44) and/or~~

5 ~~c) at the end of the path (42), the playing ball (2) falls through a clearance (46) located in the base plate (45) and is transported further.~~

10 ~~6. The method as claimed in one of the preceding claims, characterized in that the image recording unit (3) produces images (300) continually at prescribed time intervals and these images (300) are preferably displayed visibly for the players on a monitor.~~

15 ~~7. The method as claimed in one of the preceding claims, characterized in that, during a prescribed period of time, a number of images (300), in particular four, are produced and the identification of the playing ball (2) is performed~~
20 ~~on the basis of at least two images (300) recorded at different points in time, the identification for each of the images (300) being performed separately and each identification of an image (300) producing a separate identification result, an identification~~
25 ~~only being deemed to have been performed correctly if a prescribed number, in particular at least half, preferably all, of the identification results are identical.~~

30 ~~8. The method as claimed in one of the preceding claims, characterized in that an identification result is ascertained on the basis of a recorded image (300), script symbols being used as symbols and script symbols (21) arranged in circles (22)~~
35 ~~being respectively arranged on the playing balls (2), and a marking line (23) representing the direction of the script being provided, arranged in particular underneath in the direction of the~~

script and representing as it were an underlining
of the respective script symbol (21), the marking
line (23) being joined in particular to the circle
(22), in particular by way of a secondary line
5 (24),

~~in that~~

~~a) regions of the depiction of the playing ball (2)
that are bounded by a circular line, in particular
a solid circular line, are sought and stored as
10 recognition regions,~~

~~b) the alignment of symbols located within the
region is established for all the encircled regions
that are found,~~

~~that the image regions found are rotated in
15 accordance with their alignment, so that the
ascertained symbols are in each case aligned the
same,~~

~~and~~

~~c) the script symbols located in the aligned and/or
20 rotated regions are first filtered and then
subjected to a symbol recognition process and an
identification result representing the respective
symbol is ascertained for each of the aligned
regions.~~

25
~~9. The method as claimed in claim 8, characterized in
that the alignment of symbols located within the
region is established for all the encircled regions
that are found, in that the depiction of a marking
30 line adjacent the circular line or joined to it is
sought and the alignment thereof is established.~~

~~10. The method as claimed in claim 8 or 9,
characterized in that the image regions are scaled
35 to a prescribed size after they have been aligned.~~

~~11. The method as claimed in claim 8, 9 or 10,
characterized in that the identification result~~

~~that has been found for most regions being considered as the ascertained result in the event of different identification results for a number of regions.~~

5

~~12. An apparatus for identifying a playing ball (2) selected from a prescribed number of playing balls (2), each of the playing balls (2) being respectively provided with a symbol that differs from the other playing balls (2),~~

10

~~a) with an image recording unit (3), which has a recording area,~~

~~b) with means (74, 75) for moving the selected playing ball (2) from a starting position through the recording area of an image recording unit (3),~~

15

~~c) with a checking unit for checking the position and the size of the depiction of the playing ball (2), and for issuing a positioning signal in the event that parts of the depiction of the playing ball (2) are situated outside a lateral edge prescribed beforehand in relation to the image,~~

20

~~d) a positioning unit, which is arranged downstream of the checking unit and, when there is a positioning signal at its input, activates the means (74, 75) for moving the selected playing ball (2) to a new position (422) and/or for repositioning the playing ball (2), and~~

25

~~e) an identification unit for identifying symbols (21) located on the playing balls (2) on the basis of at least one image (300) recorded by the image recording unit (3), at the output of which there is an identification result that corresponds to or can be clearly assigned to a symbol (21) on the surface of the selected playing ball (2).~~

30

35

~~13. The apparatus as claimed in claim 12, characterized by a control unit which, to establish the center of mass (M) of the depiction (35) of the selected~~

5 ~~playing ball (2) in the image of the image
recording unit (3), stops or deactivates the means
(75, 40, 44, 45) for moving the playing ball (2),
so that the playing ball (2) remains unmoved in
relation to the image recording unit (3).~~

10 ~~14. The apparatus as claimed in claim 12 or 13,
characterized in that a ball guiding unit (4) is
provided, with which the playing ball (2) can be
moved from the starting position along a prescribed
path (42) through the recording area of the image
recording unit (3), the respective selected playing
ball (2) falling out of the ball guiding unit (4)
after it has moved over the prescribed path (42).~~

15 ~~15. The apparatus as claimed in claim 14, characterized
in that the ball guiding unit (4) is formed as a
flat, in particular transparent, thin plate, in
particular as a circular disk, which for receiving
the playing ball (2) has at least one eccentrically
arranged, in particular circular clearance (44),
the plate of the ball guiding unit (4) being
arranged horizontally and being mounted rotatably
and/or pivotably about a pivoting point, in
25 ~~particular the center of the circular disk, and the
recording direction or the line of sight of the
image recording unit (3) running substantially
horizontally and preferably being directed to a
point (421) on the prescribed path (42) at which
the playing ball (2) is closest to the image
recording unit (3).~~~~

30 ~~16. The apparatus as claimed in claim 14, characterized
a) in that an inlet (73) that lies directly above a
point on the prescribed path (42) is provided, an
elastic damping unit (47) for slowing down a
playing ball being provided in particular directly
underneath the inlet (73) and/or~~

- ~~b) in that a base plate (45) for supporting and guiding the playing balls (2) is provided underneath the disk shaped ball guiding unit (4), and/or~~
- 5 ~~c) a clearance of the size of a playing ball (2) is provided at the end of the path (42), in particular in the base plate (45), so that a playing ball (2) can fall through this clearance (46).~~
- 10 ~~17. The apparatus as claimed in one of claims 12 to 16, characterized by a monitor which displays images (300) recorded by the image recording unit (3) continually at prescribed time intervals.~~
- 15 ~~18. The apparatus as claimed in one of claims 15 to 17, characterized in that the clearance (44) of the ball guiding unit (4) is continued up to the edge of the ball guiding unit and, in at least one position of the path (42), a hemisphere of the~~
- 20 ~~playing ball (2) is completely displayed by the image recording unit (3) and in particular is not concealed by the ball guiding unit (4).~~
1. A method of identifying a selected gaming ball
- 25 from a predefined number of gaming balls, each of the gaming balls being provided with a symbol, which is different from the symbols of the other gaming balls, the method comprising:
- 30 a) acquiring an image of a selected gaming ball moving from a starting position through an acquisition area of an image recording unit,
- b) determining from the acquired image the center of mass of the selected gaming ball and maintaining the center of mass unaltered in the
- 35 acquired image in the image recording unit for a predefined period of time and limiting relative

movement of the center of mass with respect to the image,

5 c) determining the position and size of the image of the gaming ball and verifying whether parts of the image of the gaming ball are located outside a lateral edge predefined with respect to the image, and,

10 d) if parts of the image of the gaming ball are outside of this lateral edge, the gaming ball is shifted based on the calculated position along or opposite the progressing direction of the path of the gaming ball and brought back to the acquisition area of the image recording unit and repositioned, and steps b) to d) are repeated, and

15 e) based on at least one image recorded with the image recording unit, identifying the symbol which is unambiguously associated with the selected gaming ball.

20 2. The method in accordance with claim 1, wherein, fixing the center of mass of the selected gaming ball in the image of the image recording unit, the gaming ball is stopped and remains motionless with respect to the image recording unit.

25 3. The method in accordance with claim 1, wherein the gaming ball is moved from the starting position along a predefined path through the acquisition area of the image recording unit by a ball guiding unit, wherein the respective selected gaming ball is removed from the
30 ball guiding unit after moving on its predefined path and optionally forwarded.

4. The method in accordance with claim 3, wherein the selected gaming ball is moved forward on the predefined

path in the form of a circular arc on a horizontal plane, wherein the recording direction or line of sight of the image recording unit is essentially horizontal and directed to a spot on the predefined path in which the gaming ball is closest to the image recording unit.

5. The method in accordance with claim 3, wherein the gaming ball is received by a circular recess of the ball guiding unit, which is essentially designed to be flat and discoid, and is secured against rolling away laterally, wherein

a) the gaming ball is tossed into and/or falls onto the circular recess from above and wherein the fall of the gaming ball is decelerated, in particular by an elastic damping unit disposed below the recess, and/or

b) the gaming ball is guided and/or rotated in the recess of the ball guiding unit and supported on a base plate located beneath the discoid ball guiding unit and/or

c) the gaming ball falls through a recess located in the base plate and/or located beneath the ball guiding unit and is transported further.

6. The method in accordance with claim 1, wherein the image recording unit permanently produces images in predefined time intervals and that these images are shown on a monitor so to be visible for the players.

7. The method in accordance with claim 1, wherein, during the predefined period, a number of, in particular four, images is produced and identification of the gaming ball takes place based on at least two of images recorded at different time points, wherein

identification is done separately for each of the images and wherein each identification of an image delivers a separate identification result.

5 8. A method of identifying a selected gaming ball from a predefined number of gaming balls, each of the gaming balls being provided with a symbol, which is different from the symbols of the other gaming balls, the method comprising:

10 a) acquiring an image of a selected gaming ball moving from a starting position through an acquisition area of an image recording unit,

b) determining from the acquired image the center of mass of the selected gaming ball and
15 maintaining the center of mass unaltered in the acquired image in the image recording unit for a predefined period of time and limiting relative movement of the center of mass with respect to the image,

20 c) determining the position and size of the image of the gaming ball and verifying whether parts of the image of the gaming ball are located outside a lateral edge predefined with respect to the image, and,

d) if parts of the image of the gaming ball
25 are outside of this lateral edge, the gaming ball is shifted based on the calculated position along or opposite the progressing direction of the path of the gaming ball and brought back to the acquisition area of the image recording unit and repositioned, and steps b)
30 to d) are repeated, and

e) based on at least one image recorded with the image recording unit, identifying the symbol which is unambiguously associated with the selected gaming ball,

wherein an identification result is determined based on a recorded image, wherein symbols of writing are used as symbols and wherein symbols of writing arranged in circles are arranged on the gaming balls, and wherein a marking line representing the direction of writing is provided, which is, in particular, arranged below in writing direction and equally represents an underline under the respective symbol of writing, wherein the marking line is, in particular, connected to the circle, in particular via an auxiliary line, by

finding areas of the image of the gaming ball and saving them as recognition areas, which are limited by an, in particular solid, circular line,

for all areas limited by circular edges that were found, determining the orientation of the symbol located within the area, rotating the found image areas according to their orientation so that the determined symbols are each uniformly orientated, and

first filtering the symbols of writing located in the oriented and/or rotated areas and then subjecting them to a symbol recognition procedure and, for each of the oriented areas, determining an identification result representing the respective symbol.

9. The method in accordance with claim 8, wherein for all areas limited by circular edges that were found, the orientation of the symbol located within the area is determined by finding the image of a marking line abutting, or connected to, the circular line and determining its orientation.

10. The method in accordance with claim 8, wherein the image areas are scaled to a predefined dimension after being oriented.

5 11. The method in accordance with claim 8, wherein, in the case of differing identification results for multiple areas, that identification result is considered to be determined which has been recognized for the majority of areas.

10

12. A device for identifying a selected gaming ball from a predefined number of gaming balls, each of the gaming balls being provided with a symbol, which is different from the symbols of the other gaming balls,

15

a) comprising an image recording unit, which has an acquisition area,

b) comprising means of moving the selected gaming ball from a starting position through the acquisition area of the image recording unit,

20

c) comprising an examining unit for examining the position and size of the image of the gaming ball as well as for producing a positioning signal in case parts of the image of the gaming ball are located outside a lateral edge predefined with respect to the image, and,

25

d) a positioning unit downstream of the examining unit, which causes the means for moving the selected gaming ball to reposition the gaming ball a new position and/or to reposition the gaming ball in its entrance if a positioning signal is present, wherein the device is configured to shift the gaming ball based on the calculated position along or against the progressing direction of the path of the gaming ball, and

30

e) an identifying unit for identifying symbols located on the gaming balls based on at least one image recorded by means of the image recording unit, at the output of which there is an identification result that corresponds to, or is unambiguously associated with, the symbol on the surface of the selected gaming ball.

13. The device in accordance with claim 12, wherein a control unit, which, in order to fix the center of mass of the image of the selected gaming ball in the image of the image recording unit, stops or inactivates the means for moving the gaming ball so that the gaming ball remains motionless with respect to the image recording unit.

14. The device in accordance with claim 12, wherein a ball guiding unit is provided, by which the gaming ball can be moved from the starting position along a predefined path through the acquisition area of the image recording unit, wherein the respective selected gaming ball falls out of the ball guiding unit after being moved via the predefined path.

15. The device in accordance with claim 14, wherein the ball guiding unit is designed to be a flat, in particular transparent, thin disc, in particular a circular disc, which has at least one eccentrically arranged, in particular circular, recess for receiving the gaming ball, wherein the disc of the ball guiding unit is arranged horizontally and rotatably and/or pivotably supported around a center of gravity; and wherein the recording direction or line of sight of the image recording unit is essentially horizontal and

directed to a spot on the predefined path in which the gaming ball is closest to the image recording unit.

16. The device in accordance with claim 15, wherein

5 a) an inlet is provided, which is located immediately above a spot on the predefined path, wherein an elastic damping unit for decelerating a gaming ball is provided in particular immediately beneath the inlet and/or

10 b) a base plate for supporting and guiding the gaming balls is provided beneath the discoid ball guiding unit, and/or

c) a recess having the size of a gaming ball is provided at the end of the path, in particular in
15 the base plate, so that a gaming ball can fall through said recess.

17. The device in accordance with claim 15, wherein the recess of the ball guiding unit is continued until
20 the edge of the ball guiding unit and that a hemisphere of the gaming ball is depicted in its entirety by the image recording unit and in particular not obscured by the ball guiding unit in at least one position on the
path.

25

18. The device in accordance with claim 12, characterized by a monitor which shows images permanently recorded by the image recording unit in predefined time intervals.