May 23, 1961 Z. MATISZ 2,985,453

CUBES ALIGNING DEVICE

Filed March 2, 1959 2 Sheets-Sheet 1

FIG.1

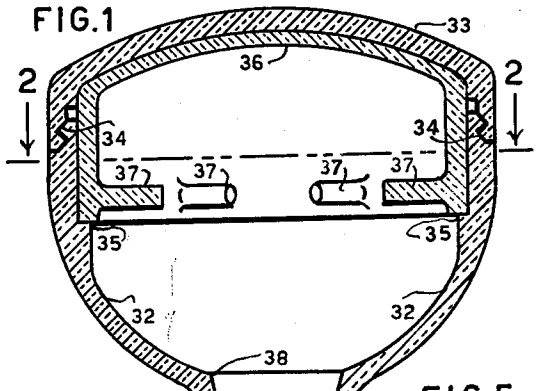


FIG.2

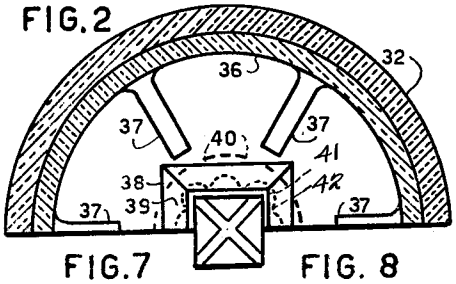


FIG.7

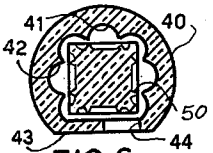


FIG. 8

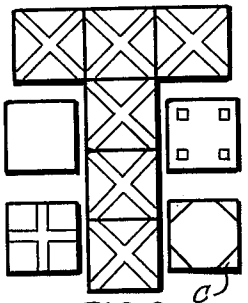


FIG.3

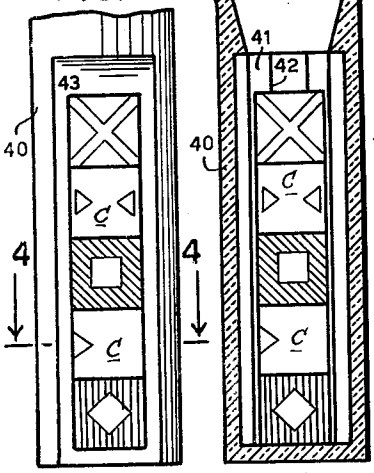


FIG.5

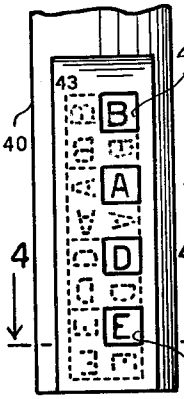


FIG.6

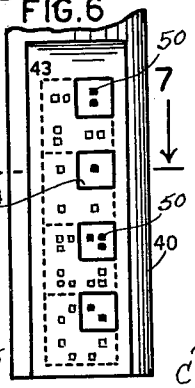


FIG.9

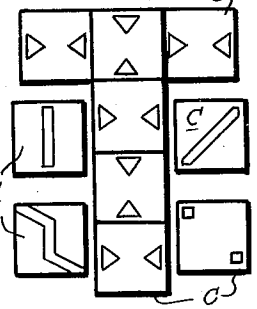


FIG.14

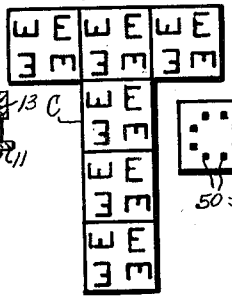


FIG.4

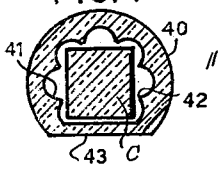


FIG.32

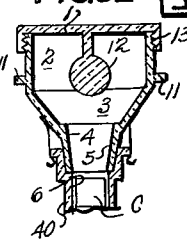


FIG.15

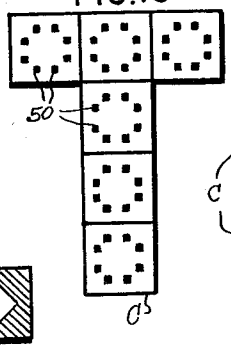


FIG.10

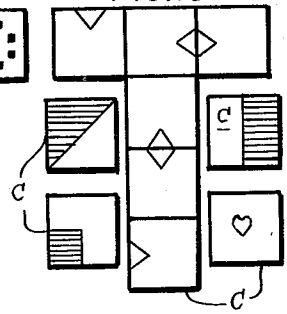


FIG.11

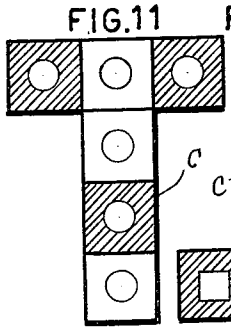


FIG.12

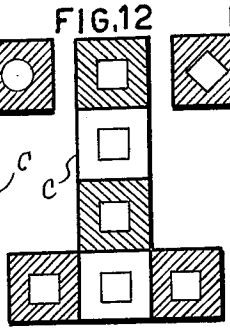
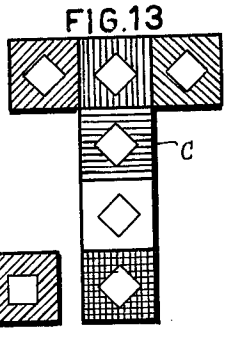


FIG.13



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CUBES ALIGNING DEVICE

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FIG.16

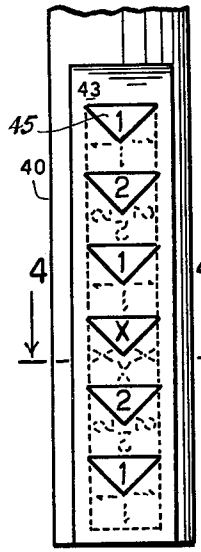


FIG.17

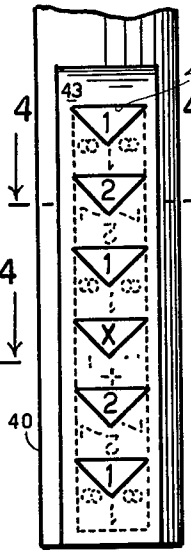


FIG.18

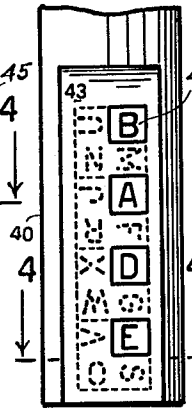


FIG.19

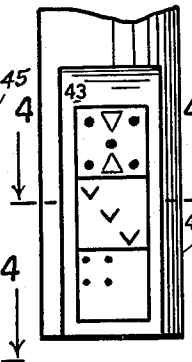


FIG.20

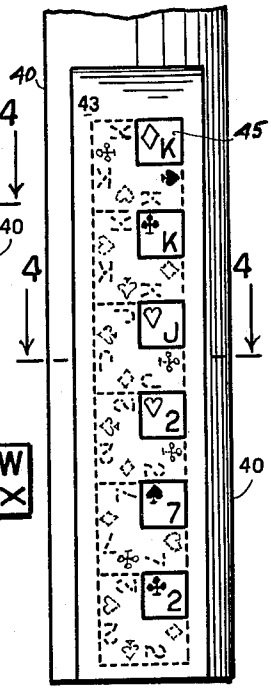


FIG.23

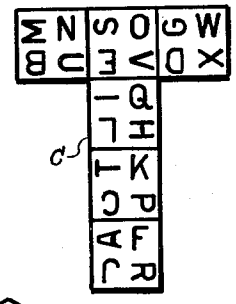


FIG.21

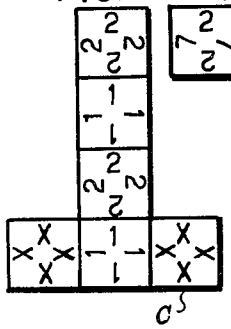


FIG.22

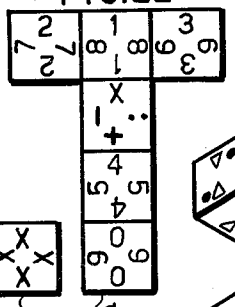


FIG.26



FIG.27

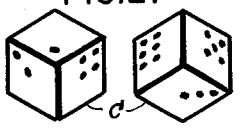


FIG.28

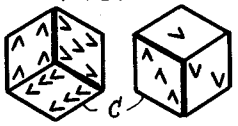


FIG.29



FIG.30



FIG.24

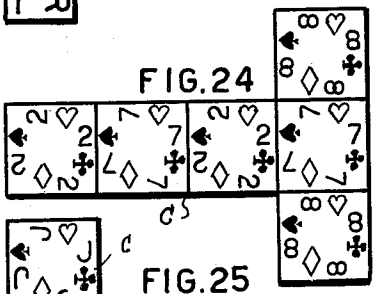


FIG.25

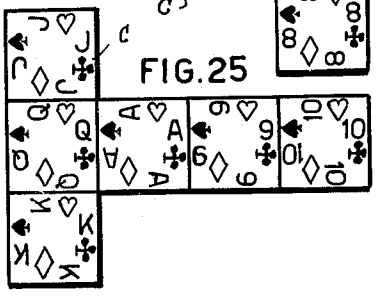
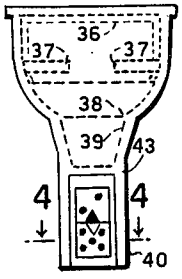


FIG.31



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United States Patent Office 2,985,453 Patented May 23, 1961

2,985,453

CUBES ALIGNING DEVICE

Zoltan Matisz, % Aschacher, Via Trenta Ottobre 8, Trieste, Italy

Filed Mar. 2, 1959, Ser. No. 796,515
9 Claims. (Cl. 273—145)

This invention relates generally to games-of-chance apparatus and more particularly to a dice or cube container and specially marked dice or cubes which may be freely agitated, turned about any axis, and tumbled in any direction within the container and then be aligned therein by chance, and is a continuation-in-part of my copending application Serial No. 565,749, filed Dec. 5, 1955, now abandoned.

Dice shakers are well known in the art and as a whole are characterized by a number of disadvantageous features. Among these are an impractical and fragile construction resulting in needless expense of the equipment or in its early destruction through breakage; an inadequate or inflexible capacity thus limiting the number of dice cubes which may be used; an inability to effect rotation and/or agitation of the container both manually and mechanically; and an inability after agitation of the cubes, to effect their alignment by chance in such a manner as to present the faces of the cubes or a portion thereof for ready viewing, etc. in a very large, predetermined number of different ways.

Accordingly, the principal object of the present invention is to provide an improved dice cube shaker and aligner and cooperating dice cubes therefor which will obviate the above and other disadvantages characterizing known structures.

An important object of the present invention is to provide an improved dice cube container which is of such capacity and structure as to ensure the proper agitation and change of position of a plurality of dice cubes contained therein and which effects the alignment of the cubes in the container in an at-rest position according to chance and enables a given face or portion thereof of each of the so-aligned cubes to be readily examined.

A further important object of the present invention is to provide an improved dice cube container and aligner of such construction as to cooperate with specially marked dice cubes to show up to 24 different and clearly distinguishable at-rest positions of each of the cubes in the aligned position.

A still further important object of the invention is to provide an improved dice cube container which will function as a shaker and as an aligner of specially marked cubes in an at-rest position, at which time the aligner permits the examination of only the same predetermined face or portion thereof of each of the aligned cubes and thus presents only one of a predetermined number of possible chance arrangements of all of the aligned dice cubes.

Another important object of the present invention is to provide an improved dice cube container and aligner, and specially marked dice cubes therefor wherein the markings are so positioned as to cooperate with transparent areas or openings formed at predetermined positions in the alinger to disclose the same area of each of the cubes.

Another object of the present invention is to provide

an improved dice cube container including an aligning tube having transparent areas or openings spaced from each other the height of a cube through which one face or a part thereof of each cube may be seen or touched, each face of each cube bearing from one to four signs, letters, numbers or symbols including raised markings such as the Braille alphabet for use by the blind, and each marking on a cube face where four are used being arranged at right angles to a different edge of the same face and further so arranged that the upright marking on such face will be aligned behind a transparent area or opening of the aligning tube.

Another object of the present invention is to provide that the unlimited variety of results accomplishable with a plurality of cubes lodged in alignment be not restricted to a sum of exposed dots like in all prior art plays and games involving dice, but shall take into consideration also and chiefly, the numerical reciprocal relations and the positional reciprocal relations of the signs, colors, numbers, letters or symbols which are compelled to register behind said transparent areas or openings of the aligning tube, once the cubes are lodged in alignment, according to the particular way in which said signs, colors, numbers, letters or symbols have been previously marked on the faces of the chosen plurality of cubes.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the drawings, I have shown two embodiments of the invention. In these showings:

Figure 1 is a central, vertical section of one embodiment of the cube container and aligner, comprising my invention, showing five cubes lodged in alignment therein;

Figure 2 is a horizontal sectional view taken on the line 2—2 of Figure 1;

Figure 3 is a fragmentary, front elevational view of the aligning tube showing the central transparent space through which the aligned five cubes are viewed;

Figure 4 is a horizontal sectional view taken on the line 4—4 of Figures 3, 5, 16, 17, 18, 19, 20 and 31;

Figure 5 is a fragmentary, front elevational view of an aligning tube having a row of spaced transparent areas and showing portions of a plurality of cubes lodged in alignment therein;

Figure 6 is a similar view of a modified form of the aligning tube for use by the blind which is provided with a row of four vertically spaced openings through which are seen portions of four cubes of the kind shown in Figure 15 having raised and tangible signs of the alphabet in Braille;

Figure 7 is a horizontal sectional view taken on the line 7—7 of Figure 6;

Figures 8, 9, and 10 each disclose a group of five differently marked cubes, one of the cubes of each group having its six faces laid out in a single plane;

Figures 11, 12, 13, 14, and 15 are stereographic views, namely each disclose in a single plane the six faces of cubes marked in different ways;

Figures 16, 17, and 18 are views similar to Figure 5 but showing either different shapes and arrangements of the transparent areas or differently marked cubes lodged in alignment therebehind;

Figure 19 is a further front elevational view of an aligning tube provided with a central transparent area and having a plurality of dice lodged in alignment therein;

Figure 20 is a further view similar to that of Figure 5;

Figures 21, 22, 23, 24, and 25 are stereographic views similar to Figure 11 showing further variations of the markings on the cubes;

Figures 26, 27, 28, 29, and 30 are perspective views

of the six faces of five pairs of dice each bearing different colors or types of markings;

Figure 31 is a front elevational view of a small pocket sized embodiment of the aligner provided with two dice lodged in alignment therein, and usable as a pendant for a key-ring, the heel of a lady's shoe, or even as the handle of a liquor glass; and

Figure 32 is a fragmentary, central, vertical sectional view to a reduced scale of another embodiment of the invention.

In its broadest aspects, the apparatus comprising the present invention involves applications of the principle that the sum (denoted by Σ) of all different aligning possibilities accomplishable by chance inside the container aligner with a plurality formed of any desired number (denoted by "n") of cubes is immutable, and is equal to $\Sigma=24^n\times n!$ (Sigma is equal to 24 at the "n" power multiplied by the factor "n") regardless of the signs and/or colors added to the faces of the cubes at rest in the aligner. This means that an aligned plurality formed of 2, 3, 4, and 5 cubes may always be lodged inside the aligner in 1,152; 82,944; 7,962,624; and 955,514,880 different positions respectively.

It is apparent that to make all of these aligning possibilities clearly distinguishable, the faces of the cubes must be marked in a particular way. Consequently, any person skilled in mathematics will be able to make distinguishable at will one, more than one, or all 24 possible and different resting positions of each cube lodged in alignment; and also none, some or all transpositions which is possible to make with the chosen plurality of cubes lodged in alignment. Thus, the container and aligner, referred to for convenience as the aligner, provide an adequate enclosed volume for proper agitation of the maximum number of dice used, and structure for preventing the jamming of the aligning tube as the dice move downwardly therethrough to the at-rest aligned position where the aligned faces or a portion thereof of the cubes may be examined.

Until the almost unlimited variety of combinations involve very large numbers, they are exploitable mostly for mathematical recreations, but when the sum of combinations are formed of small and handy numbers, they are exploitable to draw by chance horoscopes, anagrams, or any number among a previously determinable sum of possibilities, or are also exploitable to make an unlimited variety of educational or recreational plays, games of chance, fortune telling, self-testing exercises, or other pedagogical recreations.

Referring to Figures 1 to 7, inclusive, of the drawings, numeral **32** designates a transparent container which forms the upper part of the aligner and is shown as being round although it may take other shapes. A cover **33** closes the open top of the container and is suitably secured thereto as by threads **34**. The inner surface of the container **32** is provided with an annular shoulder **35** upon which an inner cap **36** is supported. The inner cap **36** is preferably of rubber or a plastic which functions to muffle the noise produced by the agitation of the dice cubes in the container and includes a plurality of circumferentially spaced, radially inwardly projecting studs **37** which terminate short of the center of the container **32**.

The studs serve to prevent the jamming of the dice cubes after their agitation and enable them to drop without hindering each other into the container outlet **38** and through its attached cube guiding funnel **39** which has the shape of an inverted frustrum of a quadrangular pyramid and terminates in a square outlet. The funnel **39** directs the movements of and straightens the positions of the dropping cubes in such a way that they are compelled to enter one after the other into the cube aligning tube **40**.

The inner surface of the aligning tube **40** includes a plurality of vertically extending contiguous, arcuate

grooves **41** (Figures 2, 4, and 7) whose intersecting edges **42** act as friction reducing cube guides and allow only a slight clearance to the side and rear faces of dice cubes C whose signs and colors are occulted by the grooves **41**. The aligning tube **40** has a flat, front face **43** along the inner side of which the fourth face of each cube slides to the at-rest aligned position and the face **43** is an opaque rectangular frame surrounding a central transparent area which exposes the front face of each of the cubes C in the aligned position (Figures 3, 19, and 31).

Where only one quarter of the face of each cube lodged in alignment has to remain visible, then the flat external opaque surface **43** is provided with a row of spaced transparent areas **45** as shown in Figures 5, 16, 17, 18, and 20. When only one quarter of a face of each cube marked with raised and tangible dots **50** of the alphabet in Braille (Figures 6, 7, and 15) and lodged in alignment has to remain touchable with the fleshy end of a finger then, the flat surface **43** is provided with a row of vertically spaced openings **44**.

A description of the principal results accomplished by the different ways, which may be changed at will, of marking each face of a cube C to be included in a desired plurality now follows:

Any face of a cube C marked as shown in Figures 8, 9, and 10 when lodged in alignment makes distinguishable one, two and four different resting positions respectively. Therefore, if the plurality of "n" cubes lodged in alignment is formed of 5 white cubes, then $\Sigma=1$ because, seemingly, only one resting position of each face of a cube and no transposition of said 5 cubes is distinguishable when said 5 cubes are lodged in alignment. If "n" is formed of one green and all other white cubes, then $\Sigma=n$. If "n" is formed of 2 green and all other white cubes, then $\Sigma=n\times(n-1):2!$ If "n" is formed of 3 green and all other white cubes, the

$$\Sigma=n\times(n-1)\times(n-2):3!$$

If "n" is formed of 1 green, 1 red and all other white cubes, then $\Sigma=n\times(n-1)$. If "n" is formed of cubes each marked with a different color, then $\Sigma=n!$ Consequently, if the plurality is formed of all five cubes shown in Figure 8, then $\Sigma=5!=1\times2\times3\times4\times5=120$ because still one lodging position of each face of a cube is distinguishable, but as each cube is marked in a different way, it is obvious that all possible transpositions are distinguishable.

If "n" is formed of one cube marked as shown flat in Figure 9, and all others are white cubes, then $\Sigma=2n$ because there are only two different lodging positions of each face of the marked cube and only the transpositions of that cube is distinguishable. If the plurality "n" is formed of all five of the cubes C shown in Figure 9, then $\Sigma=2^n\times n!=2^5\times120=3840$ because there are two different lodging positions of each face of the cubes and all possible transpositions of the five cubes are distinguishable. If the plurality is formed of one cube marked as shown flat in Figure 10 and all others are white cubes, then $\Sigma=4n$ because there are four different lodging positions of each face of the cube marked as shown flat in Figure 10 and only the transpositions of the same cube are distinguishable. If "n" is formed of all of the five cubes shown in Figure 10, then

$$\Sigma=4^n\times n!=4^5\times5!=1024\times120=122{,}880$$

The cube shown in Figure 11 is marked to duplicate the number of distinguishable combinations, namely, if "n" is formed of one cube marked and colored as shown in Figure 11 and all others are white cubes, then $\Sigma=2n$. If "n" is formed of five cubes marked as shown in Figure 11, then $\Sigma=2^5=32$.

The cube shown in Figure 12 triplicates the number of distinguishable combinations. That is, if "n" is formed of one cube marked as shown in Figure 12 and all others are white cubes, then $\Sigma=3n$. If "n" is formed

of five cubes marked as shown in Figure 12, then $\Sigma=3^5=243$.

The cube shown in Figure 13 is equivalent of a die of the common form and numbering and therefore is marked with a different color on each face to sextuple the number of distinguishable combinations, namely, if "*n*" is formed of one cube marked as shown in Figure 13 and all others are white cubes, then $\Sigma=6n$. If "n" is formed of five cubes marked as shown in Figure 13 or if "*n*" is formed of five dice of the common form and numbering, then $\Sigma=6^5=7776$.

Moreover, if inside the white space of each face of the cubes shown in Figures 11, 12, and 13, any sign shown in Figure 9 is added, then the countermarked cube increases 4, 6, and 12 times the number of distinguishable combinations, respectively. If inside the white space of each face of the cubes shown in Figures 11, 12, and 13, any sign shown in Figure 10 is added, then the countermarked cube increases 8, 12, and 24 times the number of distinguishable combinations, respectively. Consequently, the row of five cubes C shown lodged in alignment in Figures 1 and 3 may be aligned in $1\times2\times3\times4\times6\times120=17,280$ different and distinguishable lodging or at-rest positions.

The cube shown in Figure 14, as any other cube, may be lodged in alignment in 24 different resting positions, but being marked with 24 identical letters "E" is distinguishable in upright position as seemingly always the same letter "E," namely, only one resting position. The four cubes lodged in alignment in Figure 5 are each marked with 24 identical letters, but on each cube a different letter of the alphabet is marked. Therefore $\Sigma=n!$ because only all $4!=1\times2\times3\times4=24$ different transpositions of the four cubes are distinguishable. Consequently, cubes of that kind are used to draw anagrams by chance, namely, different words formed by the same letters that possess meaning, such as: BEAD, BEDA, ADEB, ABED; because only the eventual transpositions or rearrangements of the letters are distinguishable.

Figure 6 shows an aligning tube **40** provided with a row of four openings **44**. On the four cubes lodged in alignment are raised and tangible signs of the alphabet in Braille corresponding to the letters marked on the cubes shown lodged in alignment in Figure 5. In other words, with the aligning tube shown in Figure 6, a blind user is able to draw anagrams by chance. Similarly, in Figure 15 are transcribed with raised and tangible signs **50**, twenty four letters "E" of the alphabet in Braille, which are arranged exactly in the same direction and position as those "E" letters of the Roman alphabet which are marked on the faces of the cube shown in Figure 14. It is obvious that due to the particular way in which said 24 letters of the alphabet in Braille are arranged, any one of them can lodge behind an opening **44** of said aligning tube **40** in a perfectly upright position.

Each indicated dot **50** corresponds to a very small cone or pyramid about 1/64 of an inch high and their summits are spaced about 5/64 of an inch apart. Said raised and tangible dots, as indicated in Figure 7 are so impressed and sunken on the faces of the cube C that their summits are left in level with the general surface of the cube. Moreover, the hollows around said raised and tangible dots are so rounded and all disturbing uneveness so eliminated, that not only the number and position of the tangible summits may be easily ascertained by the touch of the blind user, but also said small tapering dots and hollowness cannot interfere with the sliding and shifting inside the aligner provided with cubes marked with raised dots as described.

Figures 16 and 17 disclose aligning tubes **40** each provided with a row formed of six spaced triangular transparent areas **45** with six cubes lodged in alignment therebehind. The only difference is that in Figure 16 there are six cubes marked as shown in Figure 21, whereas in Figure 17 there are six cubes marked as shown in Figure 22. Consequently, the six cubes shown in Figure 16, being each marked with 8 digits "1," with 8 digits "2," and with 8 letters "X," are suited, for instance, to draw by chance or to prognosticate six final results of six sport competitions, each played mostly between two competitors having the same probability of result, which may end for the first mentioned competitor as: Won (1), Lost (2), or Tied (X). It will be seen if a plurality is formed of "*n*" cubes marked as shown in Figure 21, that $\Sigma=3^n$ because no transposition can be made distinguishable with cubes marked exactly in the same way and with the same color, in other words, with the six cubes shown lodged in alignment in Figure 16,

$$\Sigma=3^6=3\times3\times3\times3\times3\times3=729$$

Whereas the six cubes shown in Figure 17 being each marked with digits from "0" to "9" and with the signs of the addition, subtraction, mulitiplication and division, are suitable to draw by chance one from one million of numbers, that is, any number formed of not more than 6 ciphers, or any number between 000000 and 999,999. It is obvious that the same six cubes may be used also for pedagogical purposes, because if between two or more numbers drawn simultaneously by chance, one or more signs of addition, subtraction, multiplication or division appear, then the cast may optionally be considered as void, or the indicated arithmetical process is to be figured out. Finally, as the digits from "0" to "9" are twice marked on each cube, they have twice the probability of appearing than the signs of addition, subtraction, multiplication and division which are marked only once on each cube. Anyhow, if a plurality is formed of "*n*" cubes marked as shown in Figure 22, then $\Sigma=14^n$. In other words, with the six cubes shown lodged in alignment in Figure 17

$$\Sigma=14^6=14\times14\times14\times14\times14\times14=7,529,536$$

because no transposition is distinguishable.

Figure 18 shows an aligning tube **40** provided with a row formed of four, spaced, square transparent areas with four cubes of the kind shown in Figure 23 lodged in alignment therein. As the cube shown in Figure 23 is marked with 24 different letters, it is apparent that the cube may lodge and make distinguishable all 24 different and possible lodging positions. Consequently, with a plurality of "*n*" cubes marked as shown in Figure 23, we have $\Sigma=24^n$. That is, with the plurality formed of four cubes lodged in alignment in Figure 18, the sum $\Sigma=24^4=24\times24\times24\times24=331,776$ different and distinguishable lodging positions, because each 24th part of the surface or any letter of the first cube may be associated by chance with a 24th part of the surface or with any letter of the second cube, a.s.o. But if each cube shown lodged in alignment in Figure 18 is marked with a different color, or the letters arranged on their faces are marked with a different color on each cube, then the sum would be $\Sigma=24^n\times n!$ or better, $24^4\times4!=331,776\times24=7,962,624$ because in that case not only all 24 lodging positions of each cube but also all possible transpositions of said four cubes would be distinguishable.

Figure 19 is an aligning tube provided with one transparent area showing one face of each die shown in Figures 26, 27, and 28 and lodged in alignment therein. The die lodged on the top, shown also in Figure 26, is like any other die of common form and numbering, only it is provided on each face with an additional sign of the kind shown in Figure 9, namely, making distinguishable two different resting positions of each face lodged in alignment and being the six faces marked also with spots from 1 to 6, therefore said die may be lodged in 12 different and distinguishable resting positions. On the second die, shown also in Figure 28, each spot marked on a die of common form and numbering is substituted with a cuspidated and direction showing sign, which makes

distinguishable four different resting positions of each face when lodged in alignment. Therefore, each die marked with said cuspidated signs may be lodged in alignment in 24 different and distinguishable resting positions. The die shown at the bottom and also in Figure 27 is marked like any other die of common form and numbering with the difference that the spots are not marked in perfect symmetry to the center of the faces, but are arranged eccentrically in one corner of the face, Therefore, each group of spots marked on the same face may be lodged in alignment in four different resting positions and each die marked in this particular way may be lodged in alignment in 24 different and distinguishable resting positions. However, as the three dice are each marked in a different way, they also show all possible transpositions and, therefore, may be lodged in alignment in $12\times24\times24\times6=41,472$ different and clearly distinguishable, but not equally probable, lodging positions.

Figure 20 discloses an aligning tube **40** provided with a row formed of six, spaced, square transparent areas **45** and with six cubes lodged in alignment therein. The first three cubes are marked as shown in Figure 25, that is, each cube has 24 different face values of playing-cards known as the ace, nine, ten, Jack, Queen and King of spades, clubs, hearts and diamonds. Whereas the last three cubes are marked as shown in Figure 24, namely, each cube with 12 different face values known as the 2, 7, and 8 of spades, clubs, hearts and diamonds, with each face value twice repeated. To play cartomancy, 36 different playing cards are necessary, namely, all those shown in Figures 24 and 25. And to play "poker," cubes marked as shown in Figure 25 are used.

Figures 29 and 30 each show the six faces of a die of common form and numbering but also provided with an additional triangle on each face. The only difference is that in Figure 30 the additional triangles are white and in Figure 29 are black. These two dice may be distinguishably lodged in alignment for instance in the aligner shown in Figure 31, according to the fundamental formula $\Sigma=24^n\times n!$ and since this plurality is formed of 2 dice $\Sigma=24^2\times2!=24\times24\times2=1152$.

Figure 31 discloses an aligner **40** constructed in a small size and, as above mentioned, with the two dice shown in Figures 29 and 30 lodged in alignment therein. It is obvious also that two dice of common form and numbering may be lodged in alignment inside the shown small aligner, considering the accomplishable results, not only summing up the by-chance drawn and exposed spots, but either according to the 36 different numerical reciprocal relations possible between the amounts of the spots exposed by chance. Thus, by associating each amount of spots marked on one face of the first die with an amount of spots marked on one face of the second die, or according to the 81 different positional reciprocal relations possible between the positions of the spots marked on the faces and exposed by chance, it is evident that the faces marked with one, four and five spots may lodge in alignment in only one distinguishable resting position, whereas the faces marked with two, three and six spots may lodge in alignment each in two different and distinguishable lodging positions.

A modified form of the aligner is disclosed in Figure 32 which, as in the previous figures, is made of transparent glass or plastic material and the dice cubes are also preferably formed of ivory, bone, glass, plastic or metal.

The dice cubes C are allowed to change their places and positions only inside the intercommunicating cavities of the funnel-shaped receiver **2–3**, of the cubes guiding funnel **4** and of the cubes aligning tube **6**. The funnel-shaped receiver **2–3** is a hollow cylinder **2** attached to the larger base of a truncated cone **3**, and is rather roomy and well suited to ensure a fair agitation of the dice cubes. Externally, the funnel-shaped receiver **2** is provided with two cylindrical journals **11**, diametrically opposed to each other upon which the cube aligner may revolve whenever the same is fitted to any proper bearing. The funnel-shaped receiver **2** has a removable cover **1** on the top, screwed on by means of screw-threads **13**.

From the center of the cover **1** projects inward a spherical sector **12** which serves to delay the movements of the dropping cubes in order to avoid jamming before entering into the central cavity **4**. The circular bottom of the funnel-shaped receiver **2—3** is provided with a big square outlet, shown in Figure 32, which forms the entrance to the central cavity or cube guiding funnel **4**, ending with four convergent walls **5** surrounding a smaller square outlet having a size alike to the square cavity of the interchangeable aligning tube **6**.

The quadrangular cubes guiding funnel **4** is also provided with a cavity shaped like a reversed and truncated quadrangular pyramid suited to straighten and direct the movements and positions of the dropping cubes in such a way that they are compelled to enter the outlet **5** one after the other and simultaneously with four corner-edges, so as to glide out in a straight line and with a slight clearance into the square cavity **6** of the interchangeable aligning tube which is closed at one end. Consequently, said aligning tube compels the cubes to drop in a straight line, one on the top of the other, inside the square cavity of said transparent interchangeable aligning tube **6**.

The aligning tube **6** is adapted to be detachably connected to the container **2—3** by suitable means to permit the substitution of other tubes **6** of a different capacity of dice.

The relation between the dice cubes and the cubes aligning device is such that whenever the latter is turned with the aligning tube **6** upwards, the row of cubes will glide out from the aligning tube **6** and will be disarranged when rushing across the quadrangular cubes guiding funnel **4**, so that after having struck against the rounded head of the spherical sector **12**, the cubes will drop scattered on the inner surface of the cover **1**.

On the contrary, when the cubes aligning device is turned with the aligning tube set downwards then the loose cubes, which are scattered about the inside surface of the cover **1**, after overcoming the delaying action of the pherical sector **12**, and after overstepping one by one into the cubes guiding funnel **4** will enter one after the other inside the cavity **6** of the interchangeable transparent aligning tube and drop in a straight line one on the top of the other.

It will be readily apparent that many scores of other formulas may be derived by any person skilled in mathematics by forming the desired plurality of cubes with the cubes illustrated in the drawings.

It is to be understood that the forms of my invention herewith shown and described are to be taken as preferred examples of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departure from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. A device for holding and effecting the aligning in a single row of a plurality of cubes comprising a container having an open enlarged upper portion to loosely receive the cubes and a lower discharge opening, a lower closed, tubular portion to singly receive and alignably stack the cubes and closely conform with and surround the side faces thereof, and an intermediate portion connecting said upper and lower portions for the transfer of cubes from one to another by gravity, said intermediate portion being hollow and shaped in the form of an inverted, frustum of a quadrilateral pyramid having upper and lower openings respectively of the same size as the container discharge opening and the upper end of said tubular portion, said open container being adapted to be closed to enable the agitation of the cubes therewithin, said tubular portion being provided with means to disclose at least a portion of and the same portion of

each face of only one row of aligned faces of the cubes aligned in the tubular portion, the inner surface of said tubular portion including contiguous, vertically extending, arcuate grooves the lines of intersection of which form low-friction guides expediting the stacking of the cubes in said tubular portion.

2. A device as recited in claim 1 wherein a plurality of circumferentially spaced, studs extend radially inwardly from the sides of the container terminating short of the center thereof to engage the cubes and prevent jamming thereof during their discharge from said enlarged upper portion into said intermediate portion.

3. A device as recited in claim 1 wherein said tubular portion includes a transparent area coextensive with and adjacent only one of the sides of the cubes when stacked therein.

4. A device as recited in claim 1 wherein said tubular portion is formed of occulting material on three sides only of the cubes when stacked therein so as to expose the fourth side thereof.

5. A device as recited in claim 1 wherein said tubular portion includes a flat and an opaque surface, and said flat surface includes viewing areas for at least a portion of the face of each cube stacked therein.

6. A device as recited in claim 1 wherein said tubular portion includes an opening adjacent only one of the sides of each of the cubes when stacked therein.

7. A device as recited in claim 1 wherein said tubular portion includes spaced transparent areas adjacent a portion of the face of only one side of each cube when stacked therein.

8. A device as recited in claim 1 wherein said tubular portion includes spaced openings adjacent a portion of the face of only one side of each cube when stacked therein.

9. The combination with the device recited in claim 1, of a plurality of cubes, each of said cubes having faces including an identical number of and similarly positioned markings, at least one of which markings is adapted to be disclosed by said tubular portion simultaneously with a similarly positioned marking on a face of each of the other cubes.

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