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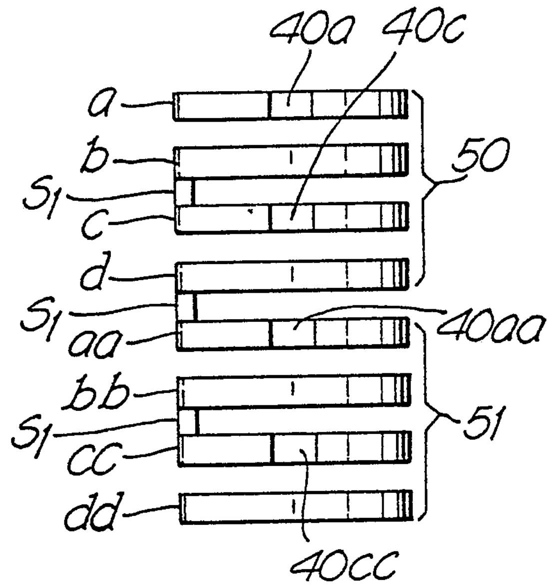
(54) Fine jewelry rope chain.

(57) A rope chain has tightly interfitting rings (a, b, c) of a given cross-section diameter. Each ring has a small gap (40) slightly larger than its cross-section diameter to permit one ring to pass through the gap of a second ring, each of said rings having an inner diameter equal to just over X times greater than the ring cross-section diameter, where X is a number equal to or greater than 3. The rope chain is formed by a plurality of assemblies of said rings, in series, each assembly comprising X+1 rings, each ring of said assembly being angularly intertwined with an adjacent ring, each said assembly of rings comprising at least one ring oriented with its gap about 180° removed with respect of the gap of at least one other ring within said assembly. Each assembly of rings comprises at least one group of two or more adjacent rings having their gaps in the same orientation, said at least two or more adjacent rings being fixedly attached to each other, each of said at least one group of two or more adjacent rings being also fixedly attached to another ring having a gap orientation about 180° removed with respect of the gaps of the rings of said group of two or more adjacent rings, and the end ring of each assembly in the series enveloping the other rings of said assembly.

Fig.8



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FINE JEWELRY ROPE CHAIN

This invention relates to a novel construction for hand-made chains, specifically jewelry chains of the type known as rope chains, and to a method for making same.

Rope chains made from precious metals have, for decades, been made largely by hand. The method of making such chains until this very day will now be described in detail with reference to Figures 1-7. The basic construction element, or component, of such rope chains is a ring formed of a solid or hollow wire, usually of precious metal, e.g. 14 karat gold. The ring 1 shown in Figure 1 has an opening or gap 2 formed therein. This gap 2 has a narrow dimension 3 at its inner diameter and a wider dimension at its outer diameter.

The solid wire forming the ring (Figure 2) usually has flattened sided and rounded ends 5 which give the ring 1 a major diameter (d_w) 6 and a minor diameter 7. The cross-section of the wire forming the ring 1 may also be of generally circular cross-section. The gap 2 of ring 1 is substantially larger than the minor diameter 7 and is slightly larger than the major diameter d_w at its narrowest dimension 3.

A multiplicity of such rings 1 are intertwined to form, in outward appearance, a double helix, as shown in Figure 3, which is the format for a standard rope chain. These tightly interfitting ring rope chains are hand-made as follows, based on the prior art teachings.

The ring 1 used for the chain should have an inner diameter (d_i) slightly more than X times greater than the major wire diameter d_w 6, and X equals 3 or an odd number greater than 3, e.g. 3.4. See U.S. Patent 4,651,517 for a detailed discussion. Referring now to Figures 4 to 7 the first ring forming the rope chain will be termed herein the a ring. It is the first of a series of four rings forming a ring assembly. In the example of Figures 4 to 7 X equals 3.

The relative orientation of the rings forming the rope chain is important. The a ring is initially oriented (manually) so that its gap, designated 20a, lies in a predetermined direction, e.g. facing generally upwardly, as in Figure 4 . The second ring of this assembly, designated the b ring, is passed through the gap 20a of the a ring, with the gap 20b of the b ring facing downwardly at about 180° removed from the a ring gap 20a, as shown in Figure 5. The a and b rings are juxtaposed and intertwined so that they lay against each other, with the periphery of the b ring lying against the periphery of the a ring, to the greatest extent possible, thereby creating a relatively large central opening 30 with the pair of intertwined abutting a and b rings. The plane of the a ring lies in parallel to the plane of the paper, and the plane of the b ring is slightly skewed from the a plane.

The gap 20c of the third ring c is then passed through the gap 20b of the b ring and over the minor diameter of the a ring and laid angularly against the a and b rings, the gap 20c of the c ring lying in the same orientation as the gap 20a of the a ring, and as shown in Figure 6, but with its plane more greatly skewed than the a and b rings. A central opening 30a still remains within the now three intertwined rings a, b and c. The planes of each of the rings differ from each other by perhaps about 20° because of their angular abutment. In the case where X equals 5, the planes of the rings would differ from each other by about 15°.

Turning now to Figure 7, the gap 20d of a fourth ring d is now passed over the a, b and c rings, through the central opening 30b, and thereby envelopes the a, b and c rings. The c ring is laid against the other rings (a-c) and its plane lies apprxoximately 20° from the plane of the c ring. The gap 20d of the d ring is disposed in the same orientation as the gap 20c of the d ring.

The just-described intertwining and orientation of a-d rings permits the continuation of the intertwining of additional assemblies of rings (of four rings each, where x = 3, or six rings each when x = 5 etc.) to create a "double helix" rope chain of a desired length. The adding on of an additional assembly of four rings is a repetition of the orientation previously described with reference to the a-d series, but the planes of this second assembly lie at approximately 90° to the planes of the respective rings in the first assembly.

It is to be noted that the gaps of the first and third ring additions of a second ring assembly abut the previous first and third rings, and the second and fourth rings pass through the gaps of the previous second and fourth rings and that the relative orientations of the gaps of the rings alternate beween adjacent rings about 180°. Thus, as far as the operator is concerned, he or she is always alternating the gap orientation while intertwining each additional ring.

After building up the rings in the manner just described, to form the double helix rope chain (Figures4 to 7), the rings are held in the desired juxtaposition temporarily by thin metal wire 25 wrapped about the rings (Figure C). Then solder S is intermittently applied, e.g. to every pair of adjacent rings usually at two points of the external periphery thereof. The wire 25 is then removed. The intermittent soldering S results in a rope chain wherein every ring pair is slightly movable, with respect to its adjacent ring pairs, and results in a chain having the desired flexibility for forming a necklace or bracelet.

Rope chains having ring diameter ratios with X being an odd number greater than 3 were disclosed in U.S. Patent No. 4,651,517, which disclosure is incorporated herewith by reference.

As is apparent from the above description, the formation of such tight fitting rope chains is extremely complex and until now they have been manufactured almost entirely by hand, particularly by skilled and expert workmen. Because of the extremely small size of these rings, the linking of the open rings requires great dexterity and manual agility and continuous concentration on the part of the workmen. Since the rings must be overturned alternately through 180° and simultaneously located so as to embrace a plurality of preceding rings, errors in the manual formation are far from infrequent. Thus the production of these chains by hand involves long periods of time and consequently is very labour-intensive which adds significantly to the selling price.

It is an object of the present invention to provide a fine jewelry rope chain produced manually with significant time saving.

It is a further object of the invention to provide a method for hand manufacturing a greater variety of fine jewelry rope chains with standard open rings than has been possible heretofore.

SUMMARY OF THE INVENTION

These and other objectives are achieved by providing a rope chain made from precious metals having tightly interfitting rings of a given cross-section diameter, each ring having a small gap slightly larger than its cross-section diameter to permit one ring to pass through the gap of a second ring, each of said rings having an inner diameter equal to just over X times greater than its cross-section diameter, where X is a number equal or greater than 3, said rope chain being formed by a plurality of assemblies of said rings, in series, each assembly comprising X + 1 rings, each ring of said assembly being angularly intertwined with an adjacent ring, each of said assembly of rings comprising at least one ring oriented with its gap turned about 180° with respect of the gap of at least one other ring within said assembly, characterized in that each assembly of rings comprises at least one group of two or more adjacent rings having their gaps in the same orientation, said at least two or more adjacent rings being fixedly attached to each other, each of said at least one group of two or more adjacent rings being also fixedly attached to another ring having a gap orientation about 180° with respect of the gaps of the rings of said group of two or more adjacent rings,and the end ring of each assembly in the series envelops the other rings of said assembly.

In the conventional method of manufacturing tightly fitting intertwined rope chains, the major labour cost involves the assembling of the rings in their proper orientation within each other. This assembling operation can account for between 80-90% of the labour cost. As was stated earlier, the workman has to take special care to introduce one ring within the other rings in proper orientation, i.e. each ring must be with its gap turned 180° with respect of the adjacent ring gap. Thus such an operation involves inserting one ring within another or within a group of rings and turning the ring to its proper gap orientation. We have discovered that it is possible to manufacture rope chains with tightly fitting intertwined rings by usiing multiple adjacent rings oriented with their gaps in the same direction. This produces a labour saving for every ring which is introduced into a ring assembly, that does not have to be turned 180°. This novel and variable arrangement of ring orientations permits the manufacture of rope chains having variable ring assemblies of both even and odd numbers, i.e. where the ratio of the inner diameter of the ring to its cross-section, X, can be even or odd number from 3 and above.

Manufacturing rope chains according to this invention with ring assemblies having at least one group of two or more adjacent intertwined rings oriented with their gaps in the same direction is made possible by fixing the similarly oriented adjacent rings to one another, so that each group of such similarly oriented rings can be considered and treated as if it were a single ring with a single gap.

The precious metals for fine jewelry rope chains of this invention may be gold, platinum, silver and their alloys.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a plan view of an open ring used for making rope chains;

Figure 2 is a cross-section of the prior art wire forming the ring of Figure A taken along the lines 2-2;

Figure 3 is a side elevation showing a section of a prior art finished rope chain;

Figures 4 to 7 show, in sequence and in perspective, the build-up of prior art rope chains from open rings;

Figure 8 is a schematic representation of a section of rope chain with the ring gap orientation alternating 180° as in the prior art, and wherein d_i is slightly greater than 3 times the ring cross-section d_w;

Figure 9 is a schematic representation of a section of rope chain in accordance with the invention, also having a 3^{+}:1 ring diameter to cross-section ratio as in Figure 8;

Figure 10 is a schematic representation of a section of rope chain according to the invention having a ring diameter to cross-section ratio of 4^{+}:1;

Figure 11 is a schematic representation of a section of rope chain in accordance with the invention, wherein the ring diameter to cross-section is 5^{+}:1;

Figure 12 illustrates schematically a section of another preferred rope chain in accordance with the invention having a ring diameter to cross-section ratio of 5^{+}:1; and

Figure 13 illustrates schematically the invention with rings having a 6^{+}:1 ring diameter to cross-section ratio.

The invention will now be discussed with reference to Figures 8 to 13 of the drawings.

Turning now to Figure 8, this shows schematically two ring assemblies in series in accordance with the prior art, where X = 3, i.e. three rings a, b and c of the first assembly and aa, bb and cc of the second assembly are intertwined with alternating gap orientations of 180° and the fourth ring d and dd of the first and second assemblies respectively is looped 50, 51 through the first three rings. Thus rings a, c, aa and cc have their gaps 40a, 40c, 40aa and 40cc, respectively turned 180° with respect of the gaps of rings b, d, bb and dd. Rings d and dd envelop (50, 51) the previous three rings of their respective assemblies. Each pair of alternating rings is soldered together S_1 leaving room for movement between pairs of rings a-b, c-d, aa-bb and cc-dd. Because of this alternating ring gap orientation, all the rings except ring a must be inserted into the group of rings by turning 180° with respect of the previous ring, thus requiring additional time consuming manipulation. Let us now compare this prior art ring assembly with the invention as illustrated in Figure 9. Here we see two ring assemblies, a to d and aa to dd, each having one group of three adjacent rings b-c-d and bb-cc-dd with the same gap orientation and only two rings, a and aa, with gaps oriented 180° with respect of these groups of rings. The rings d and dd envelop (52, 53) the previous rings of their respective ring assemblies. This arrangement of rings requires that the groups of rings, b-c-d- and bb-cc-dd, be soldered S together to form single units. The last ring d and dd of each assembly is, in this case, soldered S_1 to the first ring as, ee of the next assembly. In this example, the number of rings which must be manipulated for each assembly and turned 180° with respect to the previous ring is only one, which is a 2/3 saving of time for this type of manipulation. Overall, this arrangement can save approximately 18-20% of labour costs in the manufacture of such a rope chain. As will become apparent, this labour saving increases relative to the prior art method as the number of adjacent rings having the same gap orientation in a group increases.

It is to be understood that Figures 8 -13 represent only schematic illustrations of the gap orientation of the rings. In reality the rings are actually laid angularly against one another, being intertwined, with the plane of each ring differing from its adjacent ring as illustrated in Figure 7 for assemblies in which X = 3.

Referring now to Figure 10 this schematically illustrates a section of rope chain having a ring diameter to cross-section ratio of 4^{+}:1. Each ring assembly comprises 5 rings. In this case, rings a, d, aa and dd have their gaps in one orientation and rings b, c, e, bb, cc and ee in the opposite orientation. Rings b and c form one group and rings bb and cc form another group of adjacent rings having similar gap orientations. In this type of assembly, the rings in each group, b-c and bb-cc, are soldered to each other S, and the groups are soldered S_1 respectively to rings d and dd, which have their gaps oriented 180° from the rings in the groups. Rings e and ee envelop the preceding rings (54, 55) of their respective ring assemblies.

A jewelry rope chain as illustrated in Figure 10 based on X = 4^{+} has never been thought to be possible.

Referring now to Figure 11, this schematically illustrates a section of rope chain having a ring diameter to cross-section ratio a little over 5:1. Each ring assembly comprises 6 rings. In this arrangement, rings a, d, aa and dd have their gaps in one orientation and rings b, c, e, f, bb, cc, ee and ff in the opposite orientation. The groups of adjacent rings b-c, e-ff, bb-cc and ee-ff have similar gap orientations. In this arrangement, the rings of each group are soldered S together and the groups in turn are soldered S_1 to rings d, aa and dd respectively, which have their gaps oriented 180° from the groups. Rings f and ff envelop their respective ring assemblies (56, 57). This arrangement of rings provides a beautiful rope chain with less labour cost than is possible with the arrangement disclosed in U.S. Patent 4,651,517.

Figure 12 illustrates another variation in the orientation of the rings in an assembly having an inside ring diameter to cross-section ratio of just over 5:1. In this arrangement there are groups of three adjacent rings (b-c-d and bb-cc-dd) having the gap in the same orientation for each ring assembly. These rings are soldered together S and the groups b-c-d and bb-cc-dd are soldered S_1 to another ring e and f respectively in the assembly having an opposite gap orientation. Rings f and ff envelop (58, 59) their respective ring assembly.

Figure 13 illustrates a ring arrangement having an inside ring diameter to cross-section of just over 6:1 comprising 7 rings in each assembly. This arrangement illustrates two ring assemblies, each with a group of four adjacent rings, b, c, d, e and bb, cc, dd, ee, having the same ring gap orientation soldered S together. These groups are further soldered S_1 to rings having opposite gap orientations f and ff respectively. The time saving with respect of ring manipulation in this arrangement is even greater than in the previous illustrations.

It should also be noted thast Figure 11 and 13 illustrate fine jewelry rope chain configurations that were not contemplated nor achievable according to the prior art, where only odd number ratios X of ring diameter to cross-section were considered.

This invention makes it possible to manufacture fine jewelry rope chains with assemblies where X may be an even or odd number having from two to X number of adjacent rings with the same gap orientation.

The ratio of the ring diameter to ring cross-section is preferably X.1 to X.X and most preferably X.1 to X.7 wherein X is a number equal to 3 or more. Preferably X equals 4 to 7.

It is of course understood that hollow rings can also be used to provide further cost saving, since less precious metal is then used.

Claims

1. A rope chain made from precious metals, having tightly interfitting rings of a given cross-section diameter, each ring having a small gap slightly larger than its cross-section diameter to permit one ring to pass through the gap of a second ring, each of said rings having an inner diameter equal to just over X times greater than the ring cross-section diameter, where X is a number equal to or greater than 3, said rope chain being formed by a plurality of assemblies of said rings, in series, each assembly comprising X+1 rings, each ring of said assembly being angularly intertwined with an adjacent ring, each said assembly of rings comprising at least one ring oriented with its gap about 180° removed with respect to the gap of at least one other ring within said assembly, characterized in that each assembly of rings comprises at least one group of two or more adjacent rings having their gaps in the same orientation, said at least two or more adjacent rings being fixedly attached to each other, each of said at least one group of two or more adjcent rings being also fixedly attached to another ring having a gap orientation about 180° removed with respect to the gaps of the rings of said group of two or more adjacent rings, and the end ring of each assembly in the series envelops the other rings of said assembly.

2. A rope chain of claim 1, wherein the said group of at least two adjacent rings having their gaps in about the same orientation are held fixedly together by solder.

3. A rope chain of claim 1 or 2, wherein X = 3 and each assembly of rings comprises from two to three adjacent rings having the same gap orientation.

4. A rope chain in accordance with claim 1 or 2, wherein X = 4 and each assembly of rings comprises from two to four adjcent rings having their gaps in the same orientation.

5. A rope chain in accordance with claim 1 or 2, wherein X = 5 and each ring assembly comprises from two to five adjacent rings having the same gap orientation.

6. A rope chain in accordance with 1 or 2, wherein X = 5 and each ring assembly comprises two groups of two adjacent rings with the same gap orientation.

7. A rope chain in accordance with claim 1 or 2, wherein X = 6 and each ring assembly comprises a group of from two to six adjacent rings having the same gap orientation.

8. A rope chain in accordance with claim 1 or 2, wherein X = 7 and each ring assembly comprises a group of from two to seven adjacent rings having the same gap orientation.

9. A rope chain in accordance with any preceding claim, wherein the rings are made of precious metals selected from gold, platinum and silver or their alloys.

10. A chain as in any preceding claim, wherein the rings have hollow cores.

11. A chain as in any preceding claim having a ratio of inner ring diameter to ring cross-section diameter ranging from X.1 to X.7, where X equals any number of 3 and above.

12. A chain as in any preceding claim where X is an even number greater than 2.

Fig. 1.

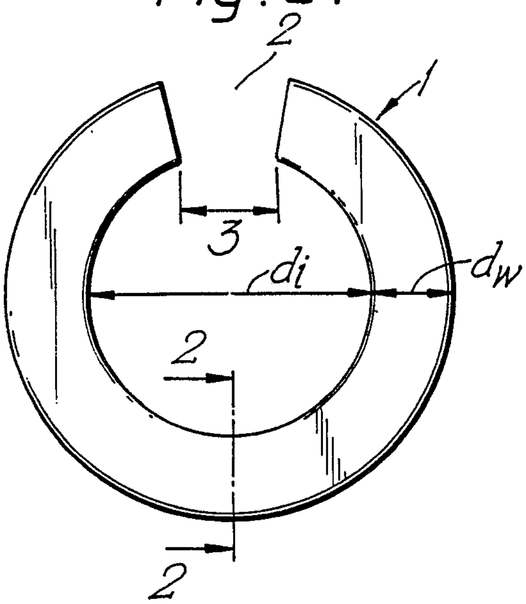

Fig. 2.

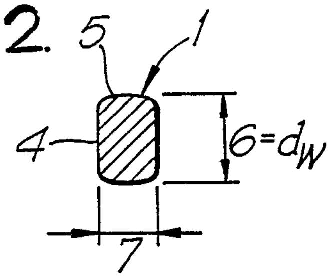

Fig. 3.

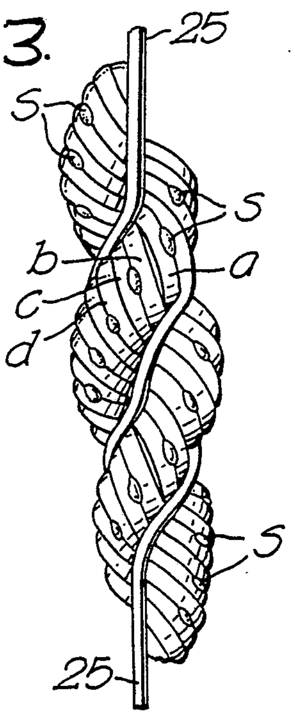

Fig. 4.

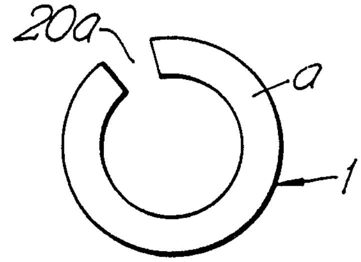

Fig. 5.

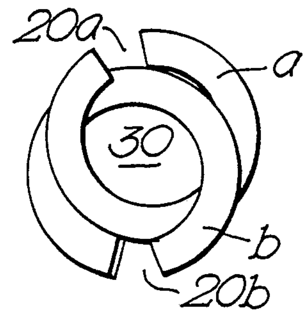

Fig. 6.

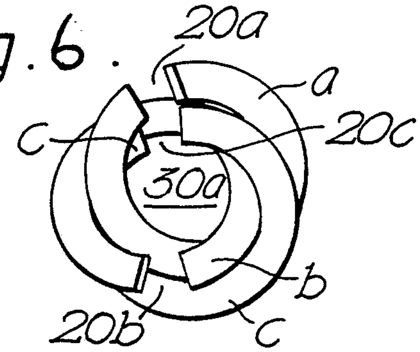

Fig. 7.

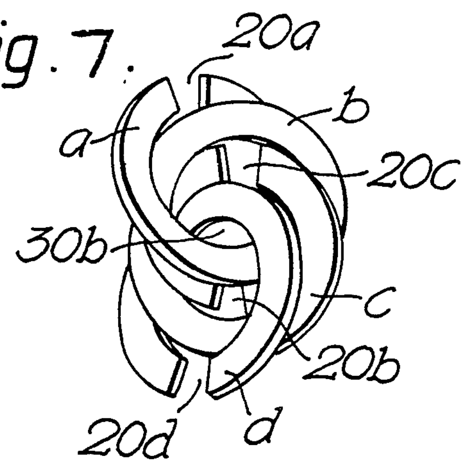

Fig.8

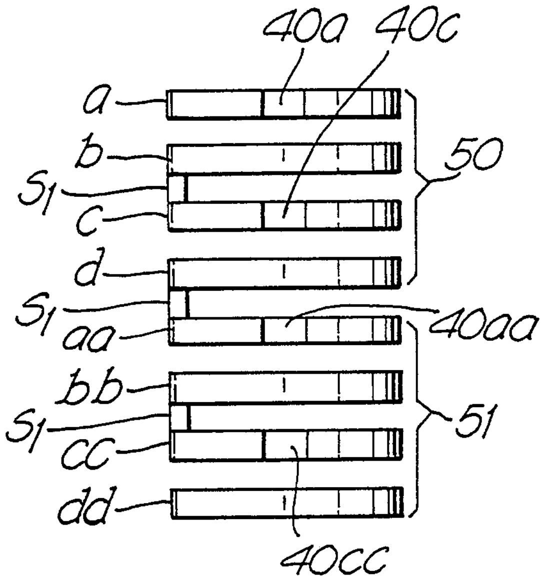

Fig.9.

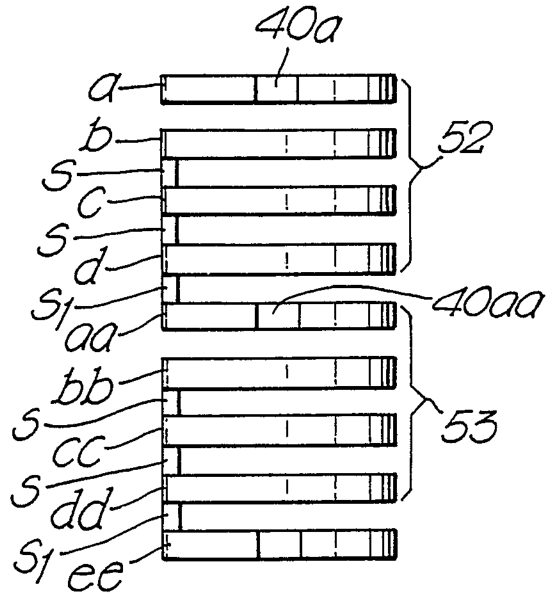

Fig.10

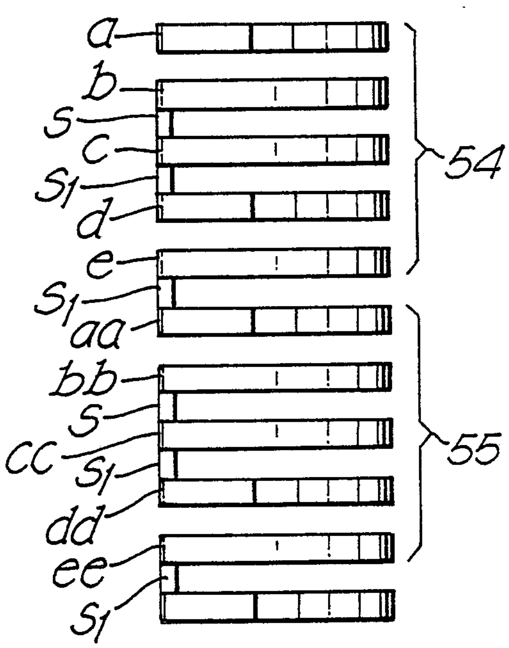

Fig.11.

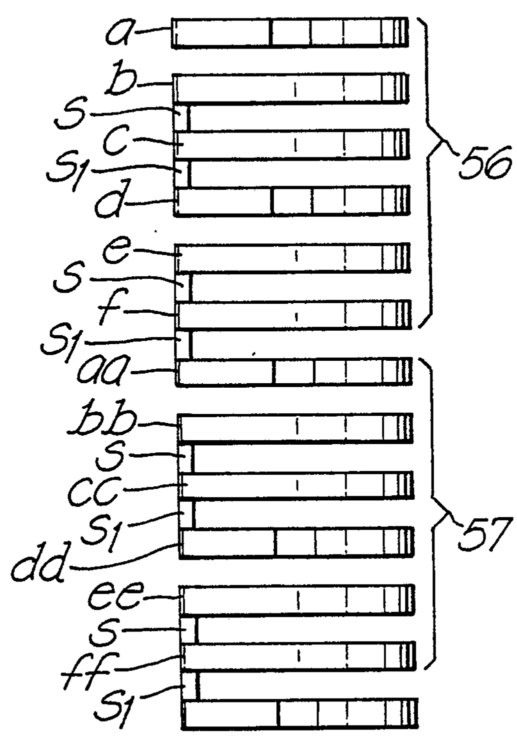

Fig.12

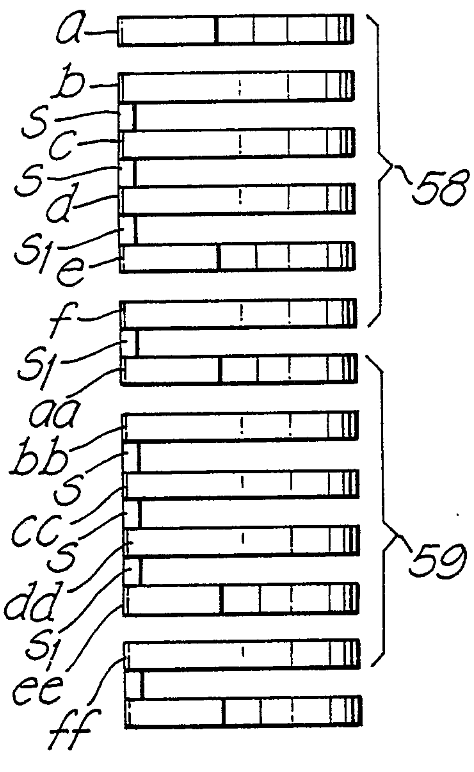
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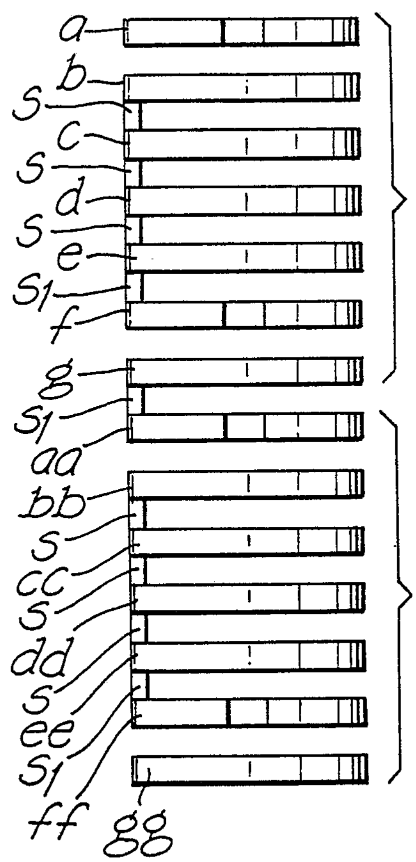
Fig.13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