United States Patent [19]

Jakobsen et al.

[11] **3,873,225**

[45] **Mar. 25, 1975**

[54] **PAVING STONES**

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[22] Filed: **Sept. 5, 1972**

[21] Appl. No.: **286,323**

[52] **U.S. Cl.** **404/41,** 52/595, 56/604

[51] **Int. Cl.** **E01c 5/00**

[58] **Field of Search** 404/34, 39, 40, 41, 73; 52/589, 590, 595, 598, 604, 605, 608

[56] **References Cited**

UNITED STATES PATENTS

130,027	7/1872	Dyer	404/41
510,259	12/1893	Higgins	404/41 X
1,660,459	2/1928	Thomson	404/41
2,013,768	9/1935	Seidler	404/41
2,549,189	4/1951	Gabo	52/589
3,221,614	12/1965	Pertien	404/41
3,379,104	4/1968	Scholl	404/41 X
3,602,111	8/1971	Clemente	404/41

FOREIGN PATENTS OR APPLICATIONS

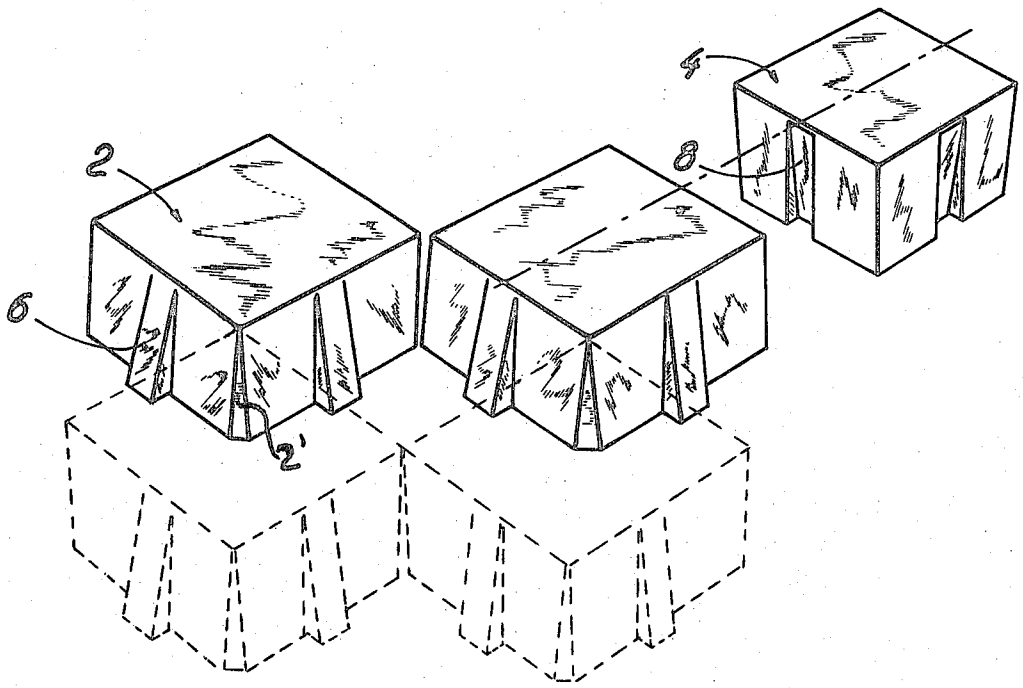
563,863	10/1932	Germany	404/41
6,513,546	4/1966	Netherlands	904/41
43,978	9/1910	Austria	404/41
37,306	3/1925	Denmark	404/41
164,663	11/1949	Austria	404/41

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Assistant Examiner—Thomas J. Holko
Attorney, Agent, or Firm—Craig & Antonelli

[57] **ABSTRACT**

A set of paving stones comprising two types of stones, one type having upwardly tapering side faces and the other type having downwardly tapering side faces, and one type being provided with protrusions at least at some of its side faces, while the other type is provided with corresponding grooves in its side faces.

5 Claims, 12 Drawing Figures



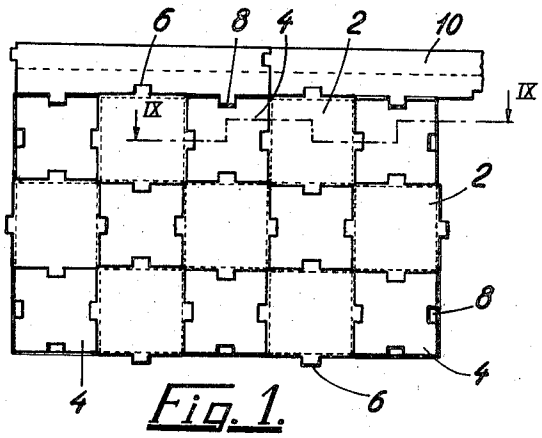


Fig. 1.

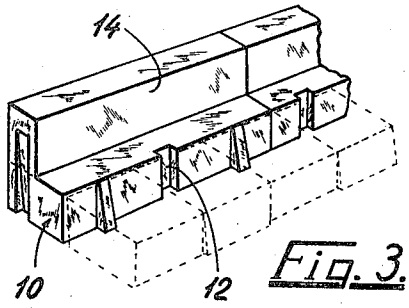


Fig. 3.

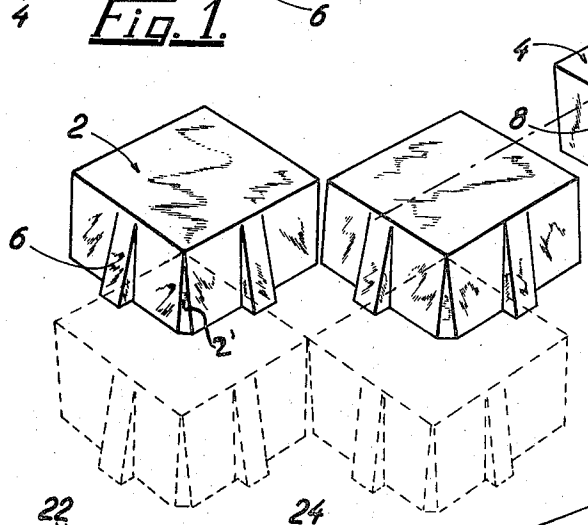


Fig. 2.

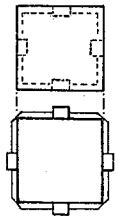


Fig. 2a.

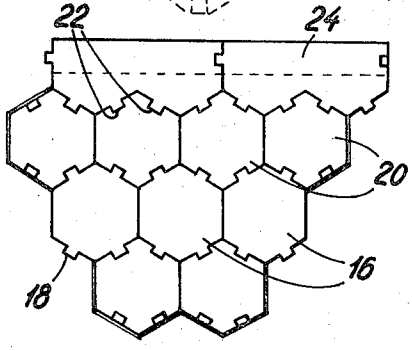


Fig. 4.

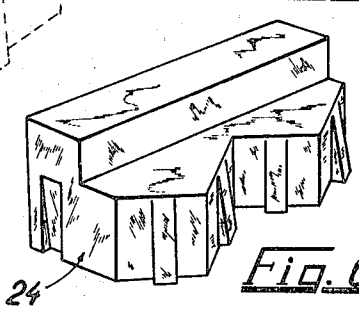


Fig. 6.

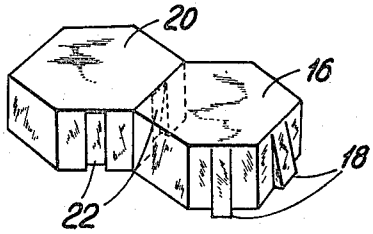


Fig. 5.

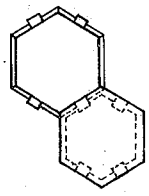


Fig. 5a.

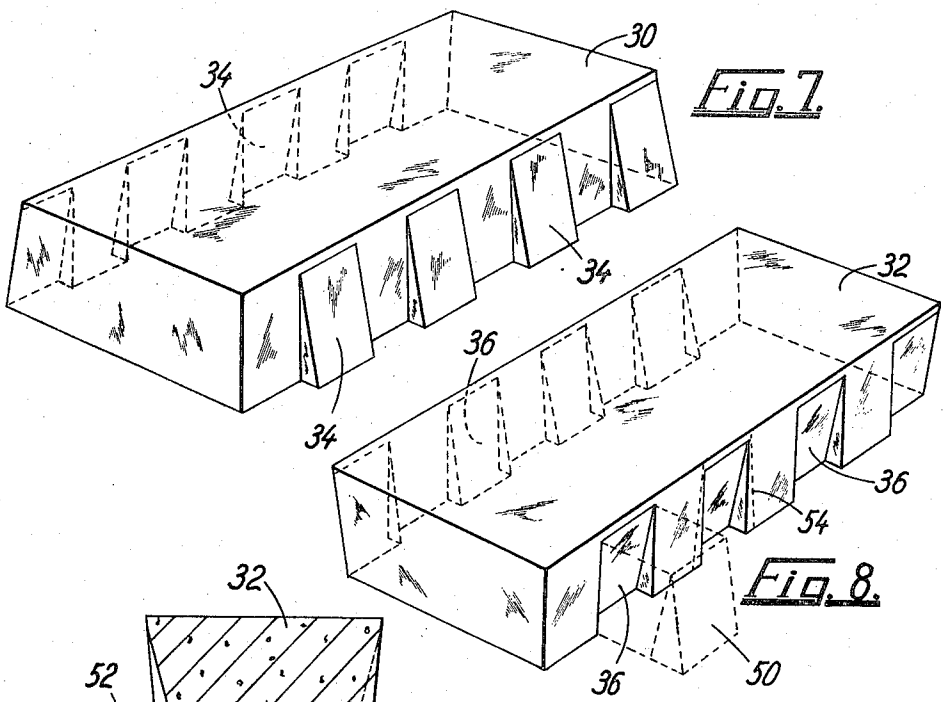


Fig. 7.

Fig. 8.

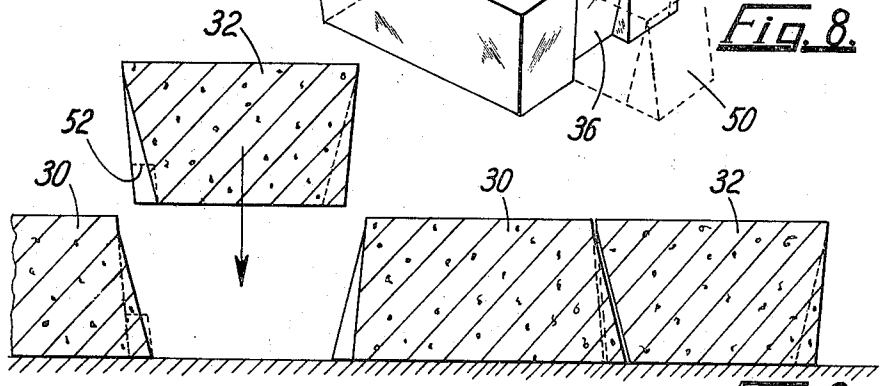


Fig. 9.

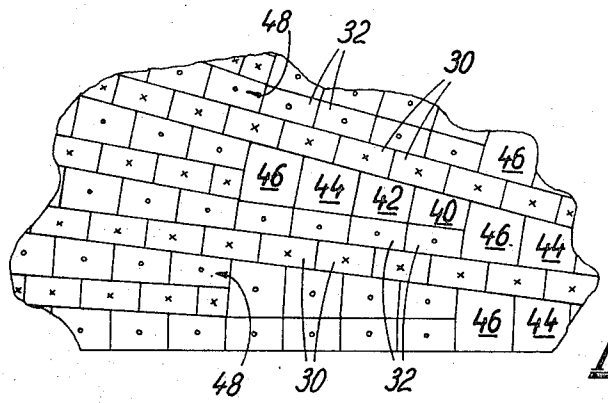


Fig. 10.

PAVING STONES

The present invention relates to a set of paving stones in which at least some of the side faces of the stones are provided with interlocking projections and depressions. Flagstones are known, the opposite longitudinally extending sides of which follow a broken line in such a way that one side of one store forms a projection that fits into a depression in the opposite side of an adjacent stone, whereby the stones are to some extent locked against mutual longitudinal displacement. However, this locking is not quite effective, because the interlocking faces will normally extend obliquely to the considered longitudinal direction or direction of displacement so that the stones may be forced apart by the displacement.

It has been proposed to form the stone sides with alternate key shaped projections and grooves so arranged that the projections of one stone will engage in the grooves of an adjacent stone. In this way the locking effect is improved, but on the other hand the stones are difficult to produce and to lay. In the molding process the mold must be able to release the stones, i.e. the side faces must be slightly slanting so that the projection of one stone will slant oppositely to or away from the bottom of the groove of the adjacent stone, which has an adverse effect on the locking properties.

The primary purpose of the invention is to provide a set of paving stones which can be laid together with a good locking effect and are easy to produce. According to the invention this purpose is attained thereby that the set comprises two types of stones, the projections being provided on one type of stones and the grooves being provided in the other type of stones. This enables the stones of one type to be produced with its sides tapering upwardly and the stones of the other type with its sides tapering downwardly, which also applies to the outer faces of the projections and the bottom faces of the grooves, respectively, so that these faces consequently can have the same inclination (or in any case be inclined in the same direction) as the adjacent side of the stone. This means that both types of stones are easy to produce with such a tapering that they can be released from the molds without difficulties and that nevertheless the stones can be placed together with their side faces as well as the faces of their projections and grooves positioned close together throughout their vertical extension, whereby an extremely stable interlocking of the stones is obtainable.

The invention offers the substantial advantage that the stones can be laid close together merely by a vertical downward movement against the support surface, the upwardly tapered stones being first placed so that spaces having the shape of the downwardly tapered stones are left between them, whereupon said latter stones are fitted in said spaces.

A further advantage of the invention is due to the fact that the downwardly tapered stones may be lifted up after the entire pavement has been laid, because they do not have to be laterally displaced in order to release the interlocking engagement with the surrounding stones. When the downwardly tapered stones around an upwardly tapered stone have been removed the latter may also be lifted up, i.e. it is possible despite the effective interlocking in a horizontal plane to break the pavement at any desired location for the purpose of making repairs or changes.

The invention will be explained in a more detailed manner in the following with reference to the drawing, in which

FIG. **1** is a schematic bottom view of a pavement carried out with an embodiment of the set of stones according to the invention,

FIG. **2** is a perspective view of some stones in a preferred embodiment of the stone set,

FIG. **2***a* is a schematic top view of the paving stones shown in FIG. **2**,

FIG. **3** is a perspective view of a kerbstone belonging to the stone set shown in FIG. **2**,

FIGS. **4**, **5**, **5***a* and **6** are views similar to FIGS. **1–3**, but showing stones according to the invention comprising hexagonal stones,

FIGS. **7** and **8** are perspective views of interfitting stones according to another embodiment of the invention,

FIG. **9** is a vertical section illustrating the method of laying stones shown both in FIG. **1** and in FIGS. **8** and **9**, and

FIG. **10** is a plane view showing a section of a pavement arranged in a curved pattern.

The pavement shown in FIG. **1** is made of square stones laid in rows consisting of alternate individual stones **2** and **4** of which the stones **2** are provided with a projection **6** at the middle of each of its four sides and chamfered corners **2'** whereas the stones **4** are provided with corresponding grooves **8** for receiving the projections **6**. As will appear the stones can be placed so that each stone is in engagement with all of the four surrounding stones by means of the projections **4** and the grooves **8**.

In the preferred embodiment of the stones shown in FIGS. **2**, **2***a* the projections **6** are wedge shaped in such a manner that they are not visible at the upper surface of the stones while they project substantially adjacent the lower surface of the stones. These stones have been molded with upwardly and inwardly slanting sides so that the projections **6** cause no problems as to the release from the molds. Similarly the grooves **8** in the stones **4** are so wedge shaped that they do not break the upper surface of the stones. The stones **4** have been molded with the sides slanting inwardly and downwardly so that molding technique does not limit the depth of the grooves **8** at the bottom end thereof.

As shown in FIG. **2** partly by broken lines one can lay two diagonal rows of stones **2** arranged with abutting corners so that between the stones cavities are formed corresponding to the shape of the stones **4**. Thereupon the stones **4** can be laid in said cavities whereby the grooves **8** will be guided down along the projections **6**. The laying of the stones is facilitated by the fact that they have smaller area at the underside than that left open at the upper side of the four surrounding stones **2**.

At its sides or ends the stone pavement can be terminated by a row of curbstones **10** each having a length of several times the side length of the stones. Said curbstones which are shown in FIG. **1** may on the side facing the pavement be formed exactly corresponding to the adjacent row of stones, but in that case joining of the curbstones will require a horizontal movement in order that the projections **6** of the stones shall engage into the corresponding grooves in the curbstones. In order to make possible a vertical laying the curbstones are preferably provided with grooves **12** which break

the upper surfaces of the curbstones so that not only the stones **4**, but also the stones **2** can be seated by a purely vertical lowering movement. The curbstones may be provided with an upwardly projecting portion **14** which forms a transitional member, e.g. to a sidewalk.

In FIG. **4** a pavement corresponding to FIG. **1** is shown carried out with hexagonal stones of which those designated **16** are provided with corresponding grooves **22**, cf. also FIGS. **5**, **5***a*. It will appear that in this arrangement wherein the grooves and the projections are formed only on four sides of the stones, i.e. on two pairs of diametrically opposite sides, a complete interlocking of the stones is obtained, it being not even possible to pull the stone rows apart. The conditions with regard to the tapered shape of the stones and the method of laying the stones are similar to the conditions described above. The same applies to the curbstones **24** shown in FIG. **6** which, however, need not be provided with grooves if as shown in FIG. **4** it can terminate a stone row exclusively consisting of stones **20** having grooves **22**. Alternatively the curbstone may be provided merely with throughgoing grooves or with both grooves and projections according to where it is to form an edge termination.

In FIGS. **7** and **8** an embodiment of two elongated interfitting stones **30** and **32** of a set is shown having a plurality of spaced projections **34** and grooves **36**, respectively, on the long sides only. This embodiment enables the stones to be laid in a bond pattern formed by staggered stones. As shown, the projections as well as the grooves are provided instaggered relationship along the two opposed stone sides whereby the bond pattern may be laid without specific attention to the orientation of the stones.

FIG. **9** illustrates the preferred method of laying the stones **30** and **32**, in which the upwardly tapered stones **30** are first laid in parallel rows so spaced as to allow the downwardly tapered stones **32** to be laid between them in interfitting relationship. FIG. **9** is representative also as a sectional view along the line IX—IX in FIG. **1** with the stones **30** and **32** corresponding to the stones **2** and **4**, respectively.

An illustrative example of a curved bond pattern is shown in FIG. **10**. This pattern can be produced by means of stones such as **30** and **32** in combination with different types of wedge shaped stones, such as those designated **40**, **42**, **44** and **46**, all having the same radial side length as the stones **30** and **32** and placed in radial rows in which they have the same wedge angle, e.g. 15° in some rows and 7 ½° in other rows, these latter rows generally being designated **48**. The short end face of the innermost wedge stone has the same length as the end faces of the rectangular stones **30** and **32**, and the length of the longest end face of the outermost wedge stone is twice that of said short end face.

Most of the rectangular stones in FIG. **10** marked with an X are male stones as shown in FIG. **7** i.e. stones provided with protrusions **34**, whilst the rectangular stones marked with an O placed adjacent to a row of X-stones are female stones i.e. stones having grooves **36** as shown in FIG. **8**, as are all of the wedge shaped stones. In this manner it is possible to obtain an effective interlocking of the stones in the curved system, though at some places it is unavoidable that two female stones are laid together. If desired, however, it is possible to lock two female stones together by means of loose locking blocks placed between the adjacent grooves **36** of said stones, as shown in dotted lines at **50** in FIG. **8**.

The invention is not restricted to the particular embodiment shown in the drawings. Thus, for example, the stones may have more complex fundamental shapes than those shown, and it would even be possible to let the upwardly tapered stones be provided with the grooves (comparable to the spaces between the protrusions **34** in FIG. **7**) and the downwardly tapered stones with the protrusions, in which case the front side of the protrusions should taper downwardly and the bottom side of the grooves taper upwardly.

The wedge shaped protrusions and grooves need not extend entirely up to the upper surface of the stones; they may terminate at a stepped portion e.g. midways on the stone sides, as shown in dotted lines at **52** in FIG. **9**, and their front sides and bottom sides respectively, may then have the same inclination as the adjacent stone side. Besides, of course, in all cases also the lateral sides of the protrusions and the grooves may taper upwardly or downwardly according to the type of the stone, as shown in dotted lines at **54** in FIG. **8**.

What is claimed is:

1. A paving stone arrangement comprising: a first and second type of stone, said stones of both types having top surfaces of substantially similar configuration, each stone of said first type having a plurality of side surfaces tapering exclusively inwardly and downwardly from the top surface thereof, at least one of said side surfaces of each stone of said first type being shaped with a substantially vertically extending groove, said substantially vertically extending groove having a depth which is largest adjacent the bottom surface of the stone and which is gradually reduced toward the top surface of the stone leaving the top surface of the stone unbroken, each stone of said second type having a plurality of side surfaces tapering exclusively outwardly and downwardly from said top surface thereof, at least one of said side surfaces of each stone of said second type being provided with a substantially vertically extending tongue-like projection received in one of said grooves of a neighboring stone of said first type, said tongue-like projections having a maximum protrusion at a base surface disposed adjacent the bottom surface of the stones of said second type and gradually diminishing toward the top surface of the stones leaving said top surface unbroken.

2. A paving stone arrangement according to claim **1**, wherein at least two of said side surfaces of each stone of said first type and each stone of said second type are respectively provided with a substantially vertically extending groove and a substantially vertically extending tongue-like projection.

3. A paving stone arrangement according to claim **2**, wherein each of the stones of said first and second type have a top surface of an elongated rectangular configuration each stone having on its opposed longer side surfaces a plurality of at least one of grooves and projections, respectively, with the remaining side surfaces being smooth.

4. A paving stone arrangement according to claim **2**, wherein each of the stones of said first and second type have a top surface of a hexagonal configuration, and wherein said tongue-like projections on said second type of stone and said substantially vertically extending

groove on said first type of stone are formed on two pairs of diametrically opposite sides of each stone.

5. A paving stone arrangement according to claim 2, wherein a curbstone is provided having a side length longer than that of the individual stones, said curbstone being provided with at least one of projections and grooves receivable with at least one of grooves and projections, respectively, of the individual stones.

* * * * *