April 30, 1968 J. NEEFF ETAL 3,380,191

ARRANGEMENT FOR CONTROLLING THE FLOW OF PEOPLE IN THE ENTRANCE OF AN AIR-RAID OR OTHER SHELTER

Filed March 8, 1965 3 Sheets-Sheet 1

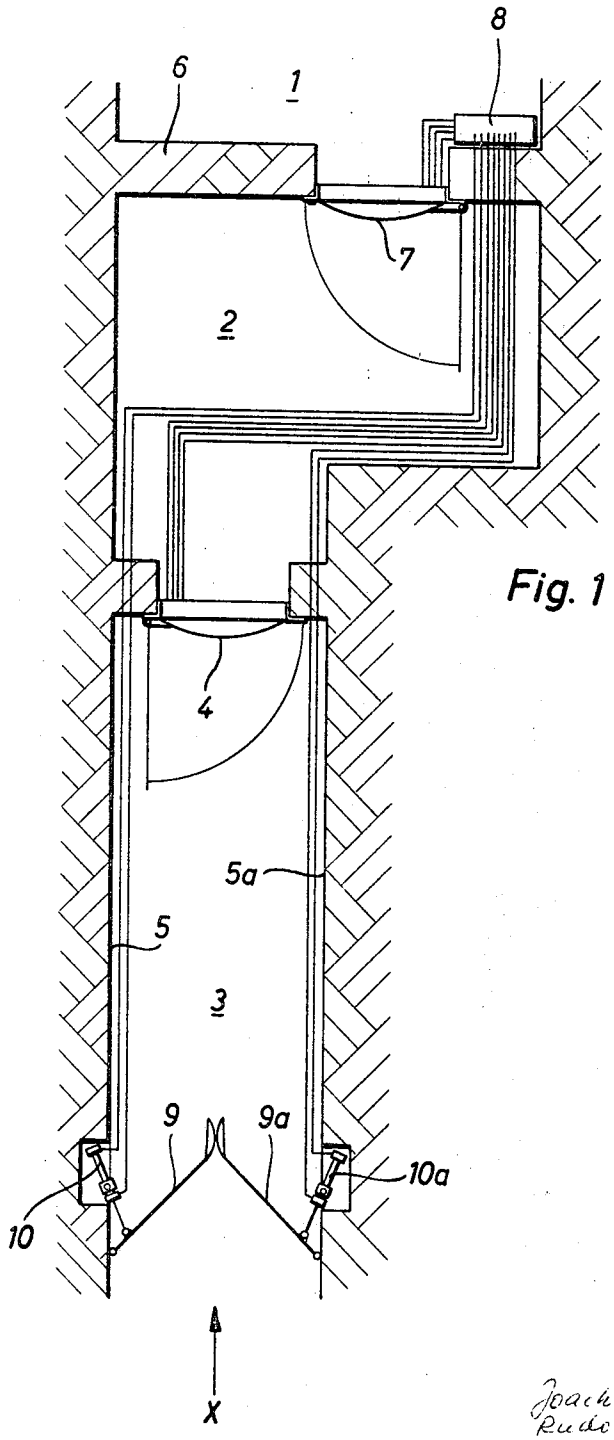



Fig. 1

INVENTORS
Joachim Neeff
Rudolf Seiz
Richard Funk

BY Michael J. Striker

April 30, 1968 J. NEEFF ETAL 3,380,191

ARRANGEMENT FOR CONTROLLING THE FLOW OF PEOPLE IN THE ENTRANCE OF AN AIR-RAID OR OTHER SHELTER

Filed March 8, 1965 3 Sheets-Sheet 2

Fig.2

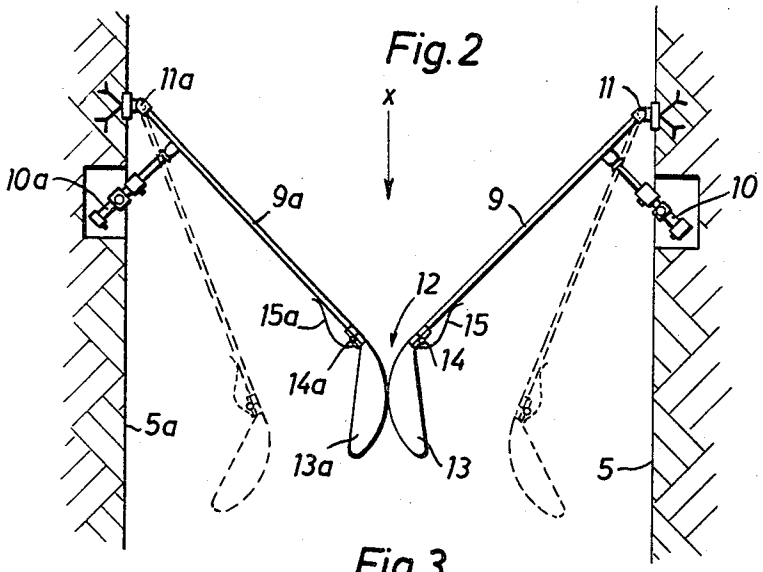
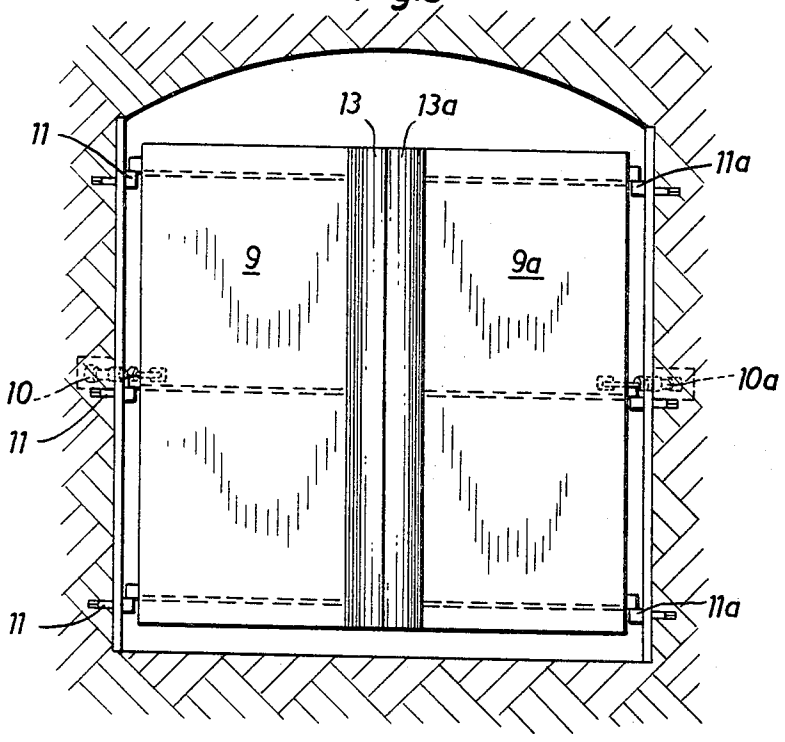



Fig.3




INVENTORS
Joachim Neeff
Rudolf Seiz
Michael Funk

BY Michael J. Striker

April 30, 1968 J. NEEFF ETAL 3,380,191

ARRANGEMENT FOR CONTROLLING THE FLOW OF PEOPLE IN THE ENTRANCE OF AN AIR-RAID OR OTHER SHELTER

Filed March 8, 1965 3 Sheets-Sheet 3

Fig. 4

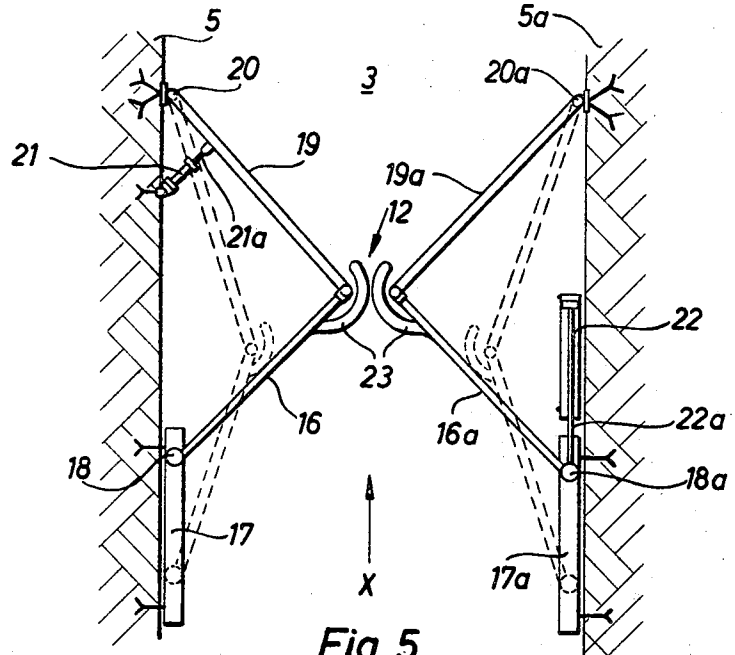
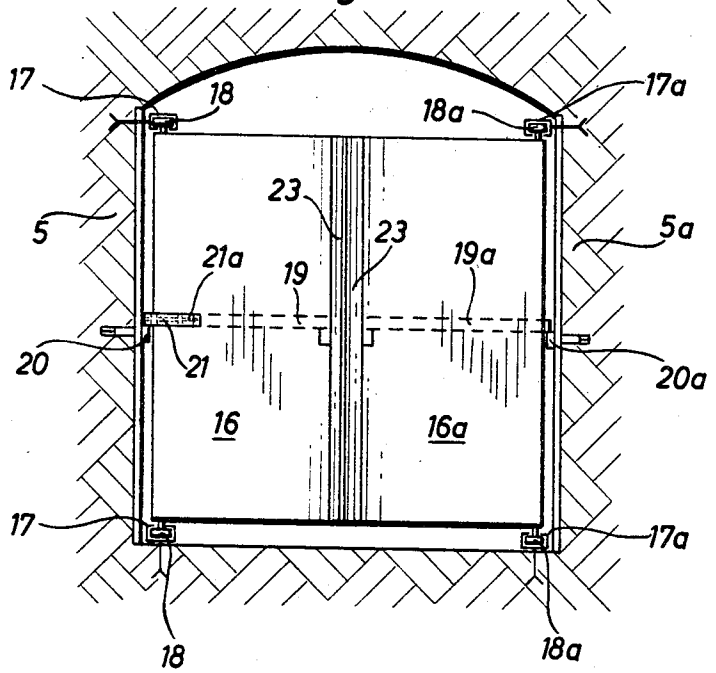



Fig. 5




INVENTORS
Joachim Neeff
Rudolf Seix
Richard Funk

BY
Richard J. Striker
Atty

United States Patent Office 3,380,191
Patented Apr. 30, 1968



3,380,191

# ARRANGEMENT FOR CONTROLLING THE FLOW OF PEOPLE IN THE ENTRANCE OF AN AIR-RAID OR OTHER SHELTER

Joachim Neeff and Rudolph Seiz, Bochum, and Michael Funk, Bischmisheim via Saarbrucken, Germany, assignors to Bochumer Eisenhutte Heintzmann & Co., Bochum, Germany

Filed Mar. 8, 1965, Ser. No. 439,135
Claims priority, application Germany, Mar. 9, 1964, B 75,804
13 Claims. (Cl. 49—49)

This invention relates to an arrangement for controlling the flow of people in the entrance of an air-raid or other shelter, especially a shelter closable by sluice gates.

In the event of a catastrophe it is difficult to feed the crowds of people into an air-raid or other shelter in as short a time as possible and without the risk of obstructing the entrance to the shelter and thereby causing injury to the people seeking refuge and thronging towards the entrance which for reasons of safety is of relatively narrow dimensions. The difficulty mainly consists in that the access ways before the shelters located mostly at a low level generally have substantially larger cross-sectional dimensions than the actual entrances which can be closed so as to be compression-proof and gas-tight. This results in jams in the immediate vicinity of the entrance of the shelter especially when large crowds of people press from the rear in the event of a panic, and such jams, on the one hand, constitute a considerable danger of accidents or injuries and, on the other hand, above all involve the risk that the entrance of the shelter, e.g. when the shelter is already completely occupied or in a moment of extreme danger, cannot be reliably closed in time.

These difficulties have a particularly disadvantageous effect when the shelter entrance is constructed as a sluice and the two sluice gates arranged at a distance behind each other must be opened and closed alternately and in dependence on each other to ensure a closure which is both gas-tight and compression-proof. A particular problem is the closing of the first sluice gate seen in the direction of entry of the people before the second sluice gate which closes the inner space of the shelter is opened, the people having entered the sluice chamber being locked therein. Because of the necessity of repeatedly having to open and close the first sluice gate while people are pressing from the rear in the access ways, not only the aforementioned dangers occur to a greater extent but above all the time required for filling the shelter is considerably increased and possibly even the reliable operation of the sluice may be jeopardized.

To reduce these difficulties it is known to provide labyrinth type access ways for such shelters or to restrict the free passage cross section of the access ways by turnstiles of the like. Both proposals have, however, not been found to be satisfactory in practice. Apart from the fact that both solutions are open to the objection that the free passage cross section cannot be varied as desired and thus be adapted to varying requirements especially when using a sluice, both the longitudinal sections of labyrinth passages offset angularly relative to one another and turnstiles involve a considerable danger of injuries when the flow of people presses hard from the rear in the event of a panic. Moreover, labyrinths for the purpose of controlling the flow of people as required especially when using a sluice, cannot be blocked without having to put up with the same difficulties as described above with reference to the actual entrances of the shelter. Turnstiles, on the other hand, have the disadvantage that they may be easily blocked by larger objects carried by the people, such as suitcases or the like.



It is the object of the present invention to overcome the aforementioned disadvantages by providing an arrangement for controlling the flow of people in the entrance of an air-raid or other shelter, especially a shelter closable by sluice gates, which comprises two fixed walls laterally bounding the entrance of the shelter and defining a free passage cross section narrowing in wedge fashion towards the shelter, and a swingable door for blocking the free passage cross section and defining an opening gap adjustable in width.

In connection with the narrowing of the passage cross section the arrangement proposed by the invention provides the advantage of narrowing the flow of people already at a relatively large distance before the opening gap of the swingable door and of largely eliminating a danger of injuries and of permitting a controlled number of persons to pass by varying the width of the opening gap, and this number can be adjusted to the respective requirements, especially those of sluice operation. A further essential advantage of the invention consists in that at the beginning of admission it is possible, by opening the swingable door to an appropriate extent, to let in relatively large numbers of people in a short time, but to restrict the passage towards the end of admission so that overfilling of the shelter is avoided and the operation of the sluice is not impaired. In addition, the arrangement proposed by the invention provides the possibility of opening the swingable door only so far that each time only one person can pass as may, for example, be desired when simultaneously with the admission a counting operation of radiation control is to be carried out.

The swingable door which in any case is so arranged that it opens inwardly may be of single-leaf construction and may be so arranged that it forms one of the two boundary walls narrowing the entrance from the side in wedge fashion.

Preferably, however, the swingable door is of two-leaf construction and the leaves which are arranged at an angle relative to each other and define the opening gap therebetween form the two boundary walls narrowing the entrance in wedge fashion.

The leaves of the swingable door which may be controlled from the inner space of the shelter and supervised, e.g. by a television system, are expediently operated by means of double-acting hydraulic rams in such a manner that they can be adjusted as desired with respect to the width of their opening gap and can be fixed in the open and closed positions. Expediently the control arrangement is such that two sluice gates are provided for blocking access to the shelter and the swingable door is adapted to be controlled in dependence on said sluice gates in such a manner that it can be opened only in the open position of the sluice gate which is the first in the direction of entry into the shelter but is closed in the closed position of said first sluice gate.

In a particularly expedient embodiment of the arrangement proposed by the invention at least one guide rail is arranged parallel to the direction of entry of the people and the leaf of the swingable door is longitudinally shiftably and simultaneously swingably mounted on its lateral edge remote from the opening gap by means of the guide rail, and at least one supporting lever is provided on which the leaf is pivotally mounted on its lateral edge adjacent the opening gap and a fixed pivot is provided in the region of the boundary wall for supporting the rear end of the supporting lever on the side of the leaf facing the entrance of the shelter. Compared with a simple pivotal mounting of the leaves of the swingable door on the fixed lateral boundary walls this embodiment of the invention affords the advantage that the closing movement of the leaf or leaves, in spite of the fact that the leaves narrow in wedge fashion towards the opening gap, takes place in the direc-

tion of the flow of people thronging towards the entrance of the shelter while the opening movement of the leaf or leaves is not impaired by the flow of people. A further substantial advantage consists in that in this construction the swingable door, due to the fact that its leaves are supported on the rear side in the region of the lateral edges adjacent the opening gap, is in all positions of operation with a larger or smaller opening gap and especially in the closing position considerably safer against yielding under the pressure of large crowds of people thronging towards the entrance of the shelter.

Especially for this purpose it is of advantage to mount and arrange the pivotable supporting levers so that they extend in the closed position of the door substantially perpendicularly to the associated leaves of the door.

According to an expedient further development of this embodiment the pressure medium operated rams serving for actuating the leaves of the door may be pivotally mounted on the fixed boundary wall and may have a movable operating member (cylinder or piston rod) pivotally mounted with its free end on the supporting lever at a relatively large distance from the fixed pivot thereof, the rams being so arranged that they engage the supporting lever with a substantially perpendicular working line in the closed position of the door. However, it is also easily possible and generally to be preferred to anchor the pressure medium operated rams firmly on the boundary walls adjacent the guide rail parallel thereto and to pivotally mount the movable operating member with its free end on the lateral edge of the leaf of the door facing the fixed boundary wall. The disadvantage of having to use rams of greater length is counterbalanced in this case by the advantage that the rams may be firmly mounted and a pivotal mounting may be avoided and, due to the absence of a lever transmission, the rams work with greater efficiency and reliability of operation.

The guide rail may, for example, be a circular guide, expediently of hollow construction, and the leaf of the swingable door may be provided with a guide roller or similarly acting guide member engaging in the hollow rail to form a positive guiding arrangement for the leaf of the door. Expediently a guide rail is arranged above and below the leaf of the swingable door and at least one supporting lever as well as the ram for operating the leaf is arranged in the central vertical region of the leaf.

It is, however, also possible and in some cases advantageous to associate with each leaf of the swingable door only one guide rail anchored in the central vertical region on the lateral boundary wall, as well as two or even three supporting levers which either engage only at the upper and lower ends or, if necessary, also in the central vertical region of the leaf of the swingable door. Further, it is evidently also possible to associate two operating rams, instead of only one, with each leaf of the swingable door.

The lateral edges of the leaves of the swingable door adjacent the opening gap are expediently provided with closing pads to avoid injuries and these closing pads may be constructed so as to yield against spring action.

Two embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which:

FIG. 1 is a ground plan view of an arrangement according to the invention for controlling the flow of people in the entrance of a shelter;

FIG. 2 is a ground plan view, on a larger scale, of a swingable or folding door;

FIG. 3 is an elevational view of the folding door of FIG. 2;

FIG. 4 is a ground plan view, likewise on a larger scale, of another embodiment of the folding door, and

FIG. 5 is an elevational view of the folding door of FIG. 4.

FIG. 1 shows a shelter with an inner space **1**, a sluice chamber **2** and an entrance **3**. The lateral boundaries of the entrance **3** are formed by two parallel walls **5** and **5***a*



and in the region of a compression-proof and gas-tight sluice gate **4**, which is the first in the direction of entry of the people, the inside cross section of the entrance **3** is restricted by two projecting portions of the walls **5** and **5***a*. Another gateway, the second in the direction of entry of the people, after the one closable by the sluice gate **4**, can also be closed by a compression-proof and gas-tight sluice gate **7** and is located between the sluice chamber **2** and the inner space **1** of the shelter and laterally displaced relative to the first gateway by an amount substantially corresponding to the width of the latter the displacement being due to a projecting wall **6**.

A folding door with two swingable leaves **9** and **9**$^a$ serves to control the flow of people in the entrance **3** and can be actuated by two conventional hydraulic rams **10** and **10***a* associated with the swingable leaves. The sluice gates **4** and **7** as well as the swingable leaves **9** and **9***a* of the folding door can be actuated or controlled from conventional type hydraulic control means, e.g. a control desk **8**. The direction of the flow of people taking refuge in the shelter in the event of a catastrophe is indicated by the arrow *x*.

As shown especially in FIGS. 2 and 3, the two leaves **9** and **9***a* of the folding door are swingably mounted by means of hinge bearings **11** and **11***a* sunk and anchored in the walls **5** and **5***a* laterally bounding the entrance **3**. The adjustment and limitation of the opening gap **12** formed between the two swingable leaves **9** and **9***a* and the fixing of the leaves **9** and **9***a* in their open and closed positions is effected by the hydraulic rams **10** and **10***a* pivotally mounted in recesses in the side walls **5** and **5***a*, the piston rods of the hydraulic rams **10** and **10***a* being hinged to the swingable leaves **9** and **9***a*.

Closing pads **13** and **13***a* are pivotally mounted by means of hinges **14** and **14***a* on the free edges of the two swingable leaves **9** and **9***a* adjacent the opening gap **12** and supported by leaf springs **15** and **15***a* in such a manner that they can be swung inwardly to a limited extent against the restoring force of the springs.

In the embodiment shown in FIGS. 4 and 5 the opening gap **12** is bounded by two swingable leaves **16** and **16***a* of a folding door which are arranged substantially at right angles relative to each other in the closed position so that they narrow the entrance **3** of the shelter in wedge fashion in the direction towards the shelter. Two parallel guide rails **17** and **17***a* are arranged on each side of the entrance **3** of the shelter and firmly anchored in the walls **5** and **5***a* above and below the swingable leaves **16** and **16***a* which are mounted in the guide rails **17** and **17***a* so that they can be shifted longitudinally therein and simultaneously swung across the entrance **3**. Guide rollers **18** and **18***a* are arranged on the swingable leaves **16** and **16***a* and engage in the guide rails **17** and **17***a* which are of hollow construction and together with the guide rollers **18** and **18***a* form a positive guiding arrangement for the swingable leaves **16** and **16***a*.

On the lateral edge adjacent the opening gap **12** each of the swingable leaves **16** and **16***a* is pivotally mounted on a supporting lever **19** or **19***a*, respectively, which engages the swingable leaf in the central vertical region thereof and extends substantially perpendicularly to the swingable leaf in the closed position thereof and is supported at its rear end by means of a pivot **20** or **20***a*, respectively, anchored in the lateral wall **5** or **5***a*, respectively.

The swingable leaves **16** and **16***a* are actuated by double-acting hydraulic rams which are controlled from the inner space of the shelter in the same manner as described with reference to the embodiment of FIGS. 1, 2 and 3.

In the embodiment according to the representation in the left-hand half of FIG. 4 a hydraulic ram **21** is swingably mounted on the wall **5** and has a piston rod **21***a* pivotally mounted with its free end on the supporting lever **19** at a relatively large distance from the fixed pivot

20 thereof, the working line of the ram in the closed position of the swingable leaf 16 extending substantially perpendicularly to the supporting lever 19.

In the different embodiment according to the representation in the right-hand half of FIG. 4 a double-acting hydraulic ram 22 is firmly anchored laterally on the wall 5*a* and extends in the region of the guide rails 17*a* parallel thereto. The hydraulic ram 22 has a piston rod 22*a* pivotally engaging with its free end directly to the slidably mounted lateral edge of the swingable leaf 16*a* remote from the opening gap 12.

The dash lines in FIG. 4 indicate the positions of the swingable leaves 16 and 16*a* of the folding door and those of the supporting levers 19 and 19*a* when the folding door is completely opened. The swingable leaves 16 and 16*a* are likewise provided with closing pads 23 directly defining the opening gap 12.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

We claim:

1. An arrangement for controlling the flow of people to an entrance comprising, in combination, two fixed boundary walls defining a passage to said entrance; a swingable door including at least one leaf mounted on one of said boundary walls and movable between a closed position blocking the passage and including a given angle with one of said walls and a plurality of positions in each of which said one leaf includes with said one wall an angle smaller than that given angle and defines an opening gap increasing as said angle decreases; at least one guide means extending along said one wall; means guiding the edge of said leaf remote from said opening gap shiftable along said guide means and swingable about said edge in such a manner that said one edge is in said closed position nearer to said entrance than in the other positions thereof; at least one supporting lever pivotally connected at one end thereof to the other edge of said leaf and pivotally connected at the other end thereof to a fixed pivot at said one wall at a location nearer to said entrance than said other edge of said leaf; and moving means cooperating with said leaf for forceably moving the latter between said positions thereof.

2. An arrangement as claimed in claim 1, wherein the swingable door is of two-leaf construction and the leaves which are arranged at an angle relative to each other define the opening gap therebetween narrowing from the two boundary walls toward the entrance in wedge fashion.

3. An arrangement as claimed in claim 1, wherein said entrance forms the entrance to a shelter and wherein two sluice gates are provided for blocking access to the shelter and the swingable door is adapted to be controlled in dependence on said sluice gates in such a manner that it can be opened only in the open position of the sluice gate which is the first in the direction of entry into the shelter but is closed in the closed position of said first sluice gate.

4. An arrangement as claimed in claim 1, wherein a resilient closing pad is provided on the free edge of the swingable door adjacent the opening gap.

5. An arrangement as claimed in claim 4, wherein the closing pad is pivotally mounted on the free edge of the swingable door and a spring element is provided on the door to permit the closing pad to swing inwardly to a limited extent against the restoring force of the spring element.

6. An arrangement as claimed in claim 1, wherein said moving means comprises a double-acting pressure medium operated ram.



7. An arrangement as claimed in claim 6, wherein the double-acting pressure medium operated ram is a hydraulic ram.

8. An arrangement as claimed in claim 6, wherein the pressure medium operated ram serving for actuating the leaf of the door is firmly anchored on said one boundary wall adjacent the guide rail parallel thereto and has a movable operating member pivotally mounted with its free end on the lateral edge of the leaf of the door facing the fixed boundary wall.

9. An arrangement as claimed in claim 6, wherein said guide means is in the form of a hollow guide rail and a guide roller is arranged on the leaf of the swingable door and engages in the hollow rail to form a positive guiding arrangement for the leaf of the door.

10. An arrangement as claimed in claim 6, wherein a guide means is arranged above and below the leaf of the swingable door and at least one supporting lever as well as the ram for operating the leaf is arranged in the central vertical region of the leaf.

11. An arrangement for controlling the flow of people to the entrance of a shelter, especially an air raid shelter, comprising, in combination, two fixed boundary walls defining a passage to said shelter; a swingable door including at least one leaf hinged along one edge about a vertical axis adjacent one of said walls and turnable about said axis between a closed position blocking said passage and in which said leaf includes a given angle smaller than 90° with said wall and in which said one edge is spaced farther from said entrance than the other edge thereof, and a plurality of positions in each of which said one leaf includes with said one wall an angle smaller than said given angle and defines an opening gap increasing as said angle decreases; moving means cooperating with said leaf for moving the same between said positions thereof; at least one sluice gate arranged in direction of movement of the people to said shelter rearwardly of said swingable door and movable between a closed position blocking access to said shelter and an open position; and control means in said shelter and controlling said moving means for opening of said swingable door only when said sluice gate is open and closing said swingable door when said sluice gate is closed.

12. An arrangement as claimed in claim 11, wherein said moving means includes a double-acting pressure medium operated ram controlled by said control means in said shelter.

13. An arrangement as claimed in claim 11, wherein said swingable door is of two-leaf construction the leaves of which are arranged at an angle relative to each other and define the opening gap therebetween narrowing toward said sluice gate in wedge fashion.


**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 220,624 | 10/1879 | Jorgensen | 49—49 |
| 428,905 | 5/1890 | Guerra | 49—49 |
| 460,719 | 10/1891 | Gajardo | 49—49 |
| 986,574 | 3/1911 | Jones | 49—49 |
| 1,390,725 | 9/1921 | Ruth | 49—49 X |
| 2,564,067 | 8/1951 | Karp | 49—68 X |
| 2,691,231 | 10/1954 | Cook | 49—49 |
| 2,760,567 | 8/1956 | Eckel et al. | 160—354 X |
| 3,079,711 | 3/1963 | Turner | 49—49 |
| 3,222,805 | 12/1965 | Hansen | 49—49 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 86,397 | 10/1958 | Denmark. |


DAVID J. WILLIAMOWSKY, *Primary Examiner.*

D. L. TAYLOR, *Examiner.*