Jan. 24, 1939. H. A. GERSBACH 2,144,718

TURNSTILE

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Fig. 1.

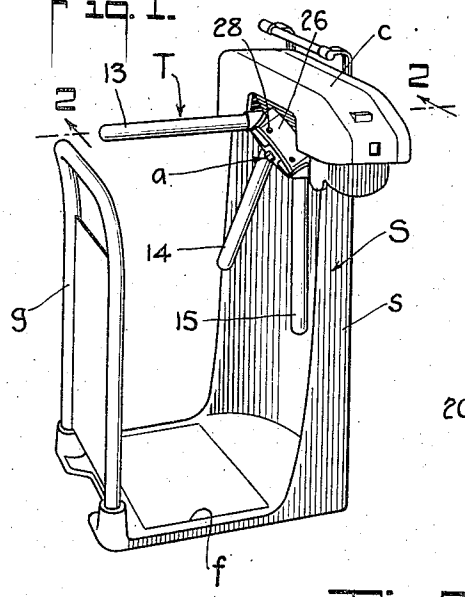

Fig. 3.

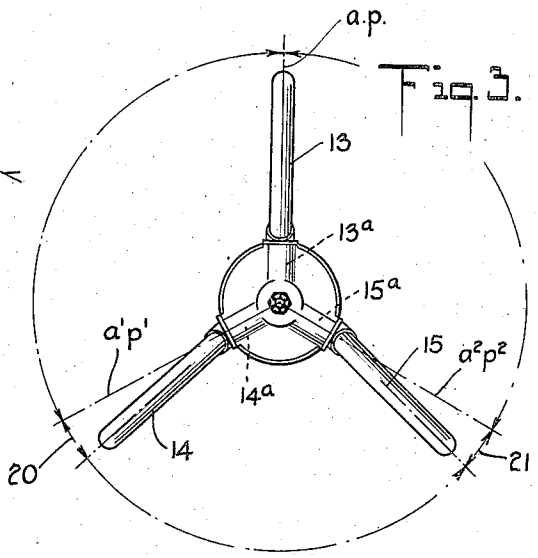

Fig. 2.

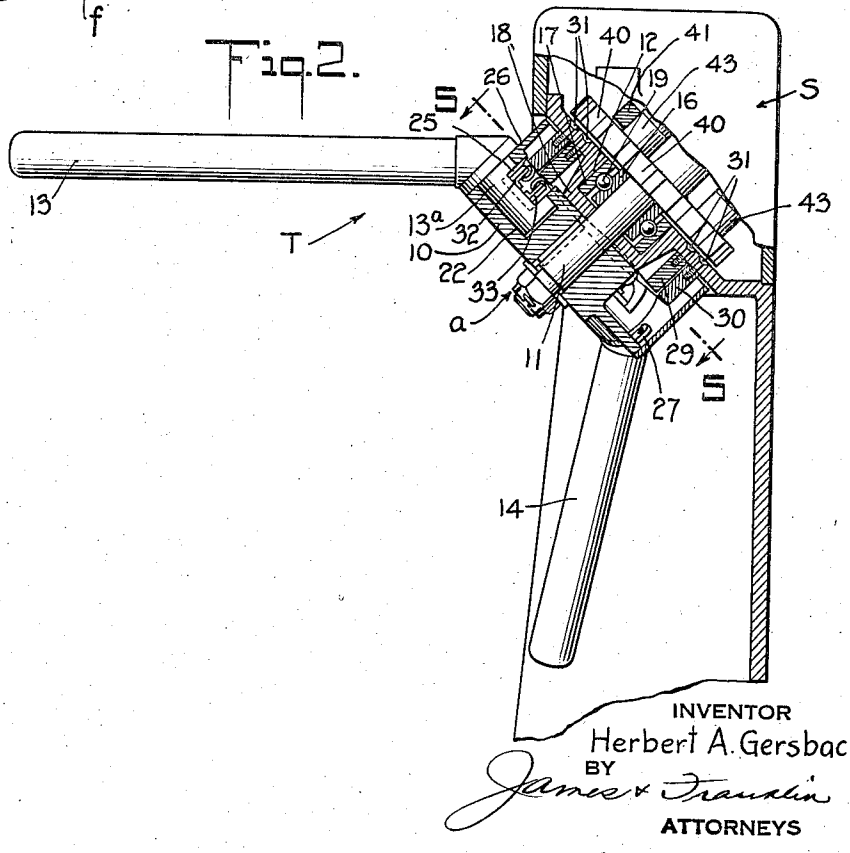

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Fig. 4.

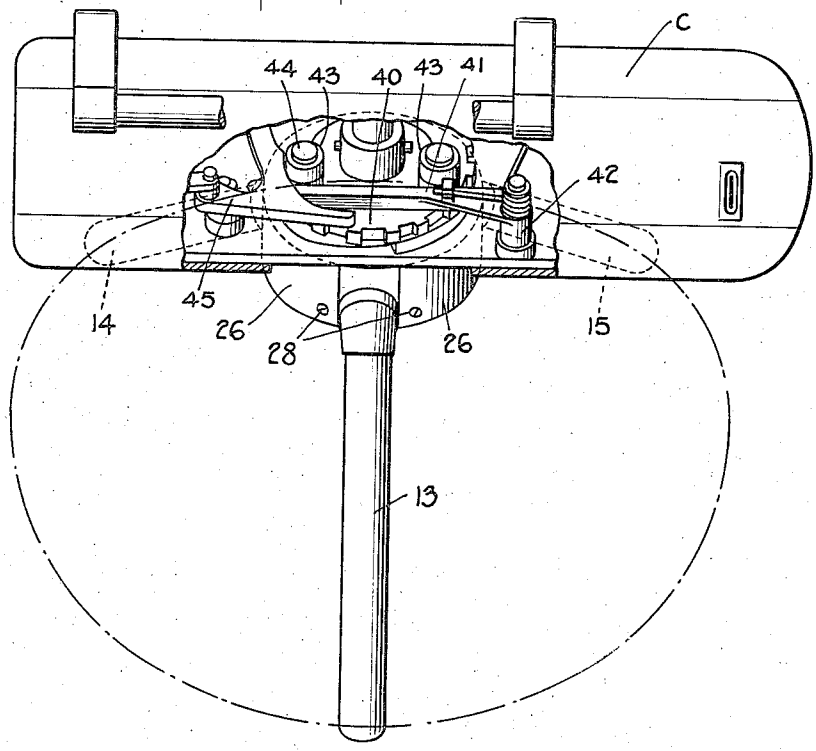

Fig. 5.

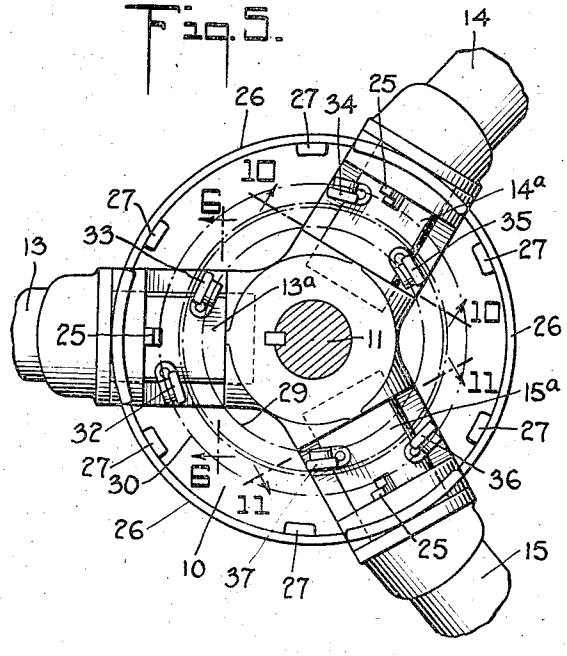

Fig. 6.

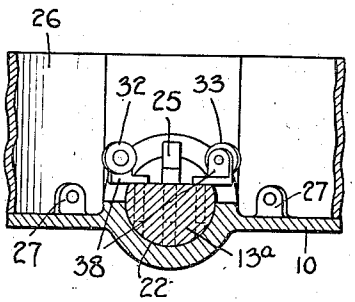

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Fig. 7.

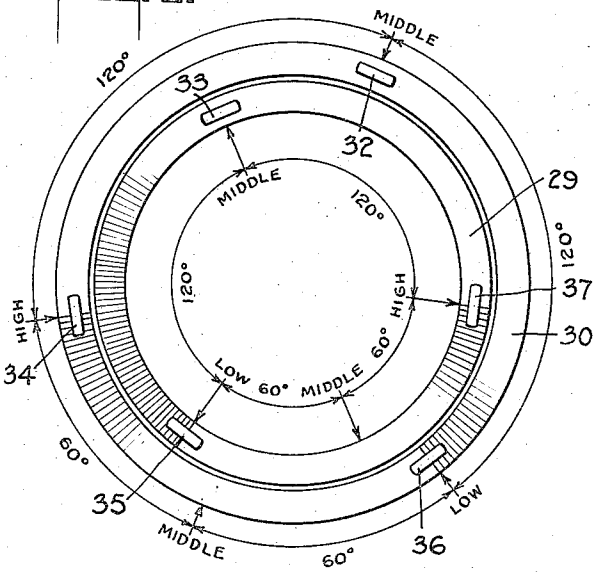


Fig. 8.

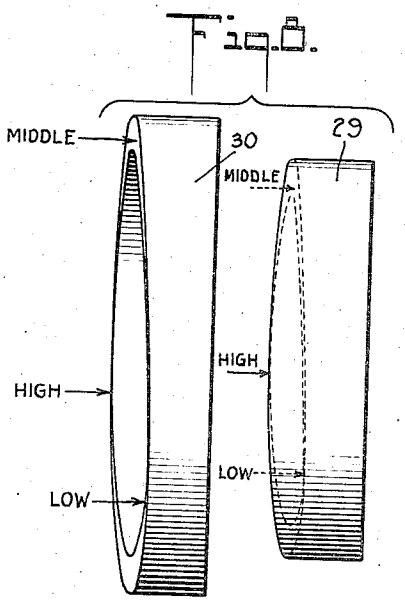


Fig. 9.

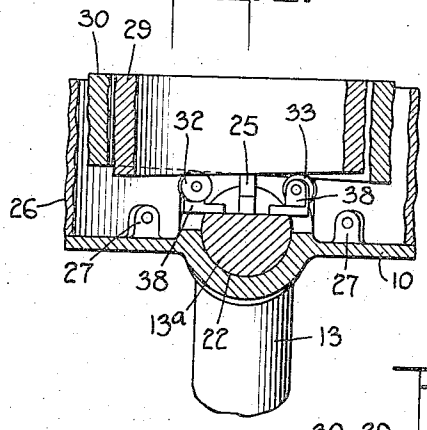


Fig. 10.

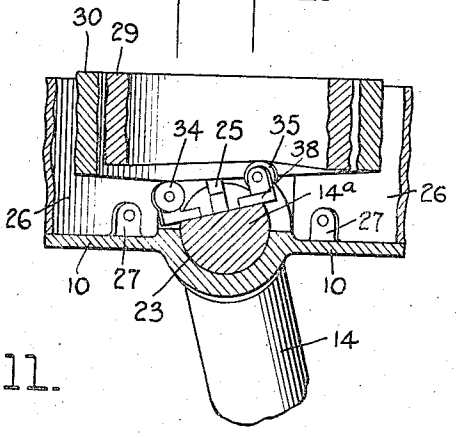
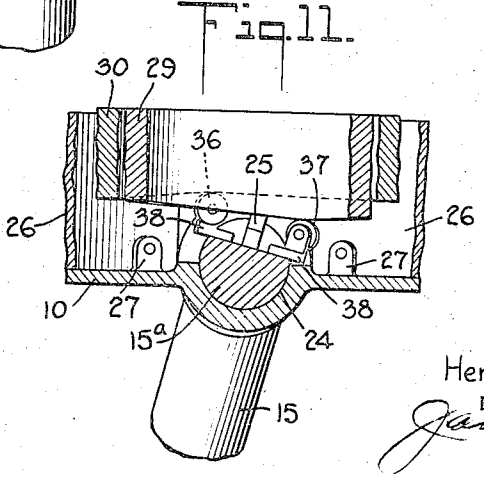


Fig. 11.



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Patented Jan. 24, 1939 2,144,718

UNITED STATES PATENT OFFICE

2,144,718

TURNSTILE

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Application August 27, 1937, Serial No. 161,229

14 Claims. (Cl. 39—3)

This invention relates to a turnstile of the space-saving type and has special reference to the provision of improvements in a turnstile of the type set forth in the Letters Patent to Kennedy and Perey No. 1,841,132 granted Jan. 12, 1932.

In this type of turnstile, the turnstile head is mounted for rotation about an inclined axis (preferably 45 degrees to the vertical) and the barrier arms carried by the head are spaced thereabout to lie and move in a surface of revolution. In the turnstile of said Patent No. 1,841,132, the barrier arms are rigid with the head, and each arm describing a true conical surface of revolution moves through a horizontal passage-barring position and a vertical (space-saving) inactive position as the head moves through a cycle of revolution. This turnstile has recently been extensively adopted particularly where space-saving is a factor as in street cars, buses, congested elevated and subway stations, at fairs, carnivals, baseball parks and the like

It is the prime object of the present invention to devise a turnstile of this described type improved so as to eliminate certain drawbacks which attend the use thereof In the turnstile of the Kennedy and Perey patent No 1,841,132, if four barrier arms be used the arms are not only spaced together too closely but the two barrier arms adjoining on opposite sides the passage-barring arm (when the turnstile is in a "home" position) project too far into the passage and result in partly obstructing said passage. When the barrier arms are reduced to three in number (as shown in said patent) these drawbacks are practically obviated yet the two inactive arms, i. e. the arms not in passage-barring position still project somewhat into and to that extent obstruct the passage through the turnstile and to the same extent reduce the effective width of the passage. To conceal the obstructing parts of these inactive arms and guard the person passing through the turnstile from striking the same, guard means has to be provided and the width of the turnstile stand or support has to be made greater than would otherwise be required. This undesirably increases the effective width of the turnstile for a given length of barrier arm.

A prime object of my present invention centers about the provision of improvements in this turnstile whereby in a "home" position of the turnstile, the inactive arms assume a more nearly vertical position whereby they do not materially project into and obstruct the turnstile passage. It follows also therefrom that the maximum available width of the passage (for any given barrier arm length) is thereby attained and the support or stand is capable of being reduced to its smallest width, thus enabling the greatest amount of space saving (in the width) to be obtained. This improvement corollarially enables the use of a longer barrier arm (and a consequent wider passage) without increasing the over-all width of the turnstile.

To cause the inactive barrier arms (those not in passage-barring position) to assume more nearly the desired vertical position just referred to, each barrier arm of the turnstile according to the present invention, instead of being made rigid with the head, is mounted for a supplemental oscillation movement in the head; and a cycle of oscillating movement is imparted thereto as the head is rotated through a cycle of revolution. In the passage-barring position the barrier arm lies in a plane passing through the inclined axis of the head, which plane may be termed an axial plane of said head. The oscillation movement which is imparted to the barrier arm is over a surface transverse to and crossing on opposite sides the said axial plane. This oscillation movement over the surface is so coordinated with the rotation movement of the head as to bring the said inactive arms more nearly to the vertical position when the passage-barring arm is in the horizontal position.

In the turnstile of said Patent No. 1,841,132 the said barrier arms move in a true conical surface as above mentioned. Because of this, a barrier arm moving away from passage-barring (horizontal) position falls or drops away somewhat too abruptly and the next succeeding barrier arm moving into passage-barring position rises somewhat too rapidly. In accordance with the principles of operation of the turnstile of the present invention, the supplemental movement which is imparted to the barrier arm as the head is rotated, is in such direction that a barrier arm moving away from the passage-barring position maintains its horizontal position longer and does not fall or drop away so quickly, and the next succeeding barrier arm moving into passage-barring position has a desired longer travel and slower rise. The supplemental movement imparted to the arms is moreover such that the two inactive barrier arms lie closer together (when the turnstile is in a "home" position) and hence makes possible a turnstile of less length (measured horizontally).

To impart to the barrier arms their supplemental oscillating motion, I have devised a novel cam

means which effectively solves a number of attendant problems. I have found that it is necessary, in order to avoid any binding action on the arm when it is pushed by a person passing through the turnstile, to move the barrier arm through the first quarter of its oscillating cycle very gradually. This I accomplish by imparting this first quarter of the oscillating cycle to an arm as the head is rotated over the first third of its rotation cycle. To make the turnstile a two-way operating one and for other reasons, the last or finishing quarter of the oscillating cycle is carried out in the last third of the rotation cycle of the head. The intermediate half of the oscillating cycle (moving the arm between the extremes of its supplemental movement) is carried out during the intermediate third of the rotation cycle; here a very large part of the oscillating movement is accomplished in a short space and consequently this phase of the oscillating movement is rapid and not gradual, but no binding action results here since at this stage of the rotation the affected barrier arms are free of the direct push of the user. It is also desired that each barrier arm in any position be held stably against looseness in its oscillating bearing. All this I accomplish by the use of a cam means embodying two concentric cam faces arranged coaxially of the head, and a pair of cam followers associated with each arm and cooperating with said two cam faces, the cam followers being arranged both circumferentially and radially of the head. So far as I am aware this cam mechanism is novel and the same is applicable to other forms of space-saving turnstiles, that is to say its use is not necessarily restricted to turnstiles of the inclined axis type.

To the accomplishment of the foregoing and such other objects as will hereinafter appear, my invention consists in the turnstile combination and parts thereof as hereinafter described and sought to be defined in the appended claims. Herein there is described a preferred form of the invention in connection with the following drawings, of which:

Fig. 1 is a perspective view of a form of portable and complete-unit turnstile embodying the improvements of the present invention;

Fig. 2 is an enlarged view thereof taken in cross-section in the plane of the line **2—2** of Fig. 1, with parts shown in section and exhibiting the principal structural features of the improvements hereof;

Fig. 3 is a front view looking in the direction of the rotation axis of the turnstile, and this figure depicts the combined rotation and oscillation movement of the barrier arms;

Fig. 4 is a top plan view of the turnstile part shown in Fig. 3 with part of the casing broken away to exhibit some of the mechanism in the casing;

Fig. 5 is a view of the turnstile parts taken in cross-section in the plane of the line **5—5**, Fig. 2, and showing the parts on a more enlarged scale;

Fig. 6 is a fragmentary view taken in the plane of the line **6—6**, Fig. 5;

Fig. 7 is an explanatory view of the cam means (the cam parts and the cam followers), this view explaining the rotation and oscillation cycles of the barrier arms;

Fig. 8 is a view of the cams, showing the same separated for greater clarity;

Fig. 9 is another view taken in cross-section in the plane of the line **6—6**, Fig. 5, showing the position a barrier arm assumes in a passage-barring position;

Fig. 10 is a view taken in cross-section in the plane of the line **10—10**, Fig. 5, and showing the position a barrier arm assumes in one of its inactive positions; and

Fig. 11 is a view taken in cross-section in the plane of the line **11—11**, Fig. 5, showing the position a barrier arm assumes in its other inactive position.

Having reference now to Fig. 1 of the drawings wherein a portable turnstile embodying the improvements of the present invention is shown, the turnstile comprises a support generally designated as S on which the turnstile proper, generally designated at T, is mounted, the turnstile being mounted to rotate about an inclined axis *a* (preferably 45 degrees to the vertical). The support S comprises a strong metal stand *s*, a non-skid floor plate *f* connected thereto, and a "built-in" guide rail *g* set at the right height and distance from the passage-barring arm of the turnstile unit. The support S is surmounted by a casing *c* which contains various control and operated parts (some of which is referred to below). This unit shown in Fig. 1 is complete in itself and can be moved from place to place and used for temporary work at street cars and bus loading areas and at fairs, stadiums, baseball parks, etc.

The turnstile proper T comprises a head **10** mounted on the support S to rotate about the referred to inclined axis *a* by being keyed to a shaft **11** rotatable in the ball bearing **12**, the said head carrying the barrier arms **13**, **14**, and **15**. The ball bearing **12** may be of any accepted construction, comprising a race **16** fixed to the shaft **11**, a race **17** fitted to a supporting cradle **18**, and intervening bearing balls **19**. The barrier arms **13**, **14** and **15** are disposed about and all on one side of the head in generally conical formation, each barrier arm moving through a horizontal (passage-barring) position and a vertical (space-saving) position as the head is rotated. When the turnstile is in a "home" position (as shown in Fig. 1) the passage-barring arm **13** is horizontal, lies in a plane passing through the axis *a* of the head, which plane is herein referred to as an axial plane of the head, and is arranged at 45 degrees to the said axis. Were it not for the supplemental oscillation movement which is imparted to these barrier arms, each barrier arm would describe a true conical surface of revolution as the head is given a cycle of rotation (see Kennedy and Perey Patent No. 1,841,132).

To accomplish the various aforestated objects of the present invention, each barrier arm is given a motion supplemental to its rotation movement. This supplemental motion consists of a cycle of oscillation (for every rotation cycle) over a surface which is transverse to and crosses on opposite sides the axial plane associated with the particular barrier arm. The combined rotation and oscillation movement of the barrier arms is such that in a "home" position of the turnstile the inactive arms (the arms not in passage-barring position) (such as the arms **14** and **15** illustrated) are disposed inwardly of the axial planes associated therewith. Fig. 3 of the drawings diagrammatically depicts this movement of the barrier arms. The passage-barring arm **13** lies in its axial plane *a. p.*; the inactive arm **14** has been moved (the first quarter of its oscillation cycle) from its axial plane *a'p'* an angular distance indicated by the doubled arrow **20**; and the inactive arm **15** has been moved (the inter-

mediate half of its oscillating cycle) over an angle equal to twice the angle 20 (this movement being relative to the rotated head), so that it then assumes a position spaced the angle 21 on the opposite side of its axial plane a^2p^2. The angular distance between the referred to axial planes gives the distances through which the turnstile head 10 moves in the three steps of a rotation cycle of the head. Fig. 3 therefore indicates a number of the advantages hereinbefore outlined, namely (1) the inactive arms 14 and 15 lie more closely together and hence make possible a turnstile of less length (measured horizontally) and (2) the barrier arm (such as 15) moving into the passage has a desired longer travel and slower rise.

To impart the desired supplemental movement to each barrier arm, each arm is made to comprise an arm proper extending from the head and an axis portion arranged to lie in the plane of the head. Thus the arms 13, 14 and 15 are provided with integral axis portions 13a, 14a and 15a. Preferably the axis portions are arranged radially of the head or intersecting the axis of the head. It follows that the angle between a barrier arm and its axis portion is 135 degrees with the arrangement shown in the drawings. With this construction it will be seen that each barrier arm is capable of an oscillation movement over a surface tangential to a theoretical cone of revolution of said arms. More accurately stated, each arm has an oscillation movement over a surface transverse to and crossing on opposite sides the axial plane associated therewith. The head 10 is provided with three radially arranged sockets 22, 23 and 24, which receive the axis portions 13a, 14a and 15a of the barrier arms. Each arm is held in its socket by means of a pin 25 received by a hole in the axis portion of the arm, which pin bears against an interior surface of the head 10, which head is completed by the encircling side wall sections 26, 26, the latter being affixed to the head 10 by any suitable means, as by attaching lugs 27, 27 integral with the head and screws 28, 28 received by apertures in the said encircling side wall sections 26, 26.

To impart the desired oscillating movement to the barrier arms, I provide a novel cam means arranged within and to be concealed by the head 10 and encircling side wall sections 26 thereof. This cam means comprises a fixed cam element having two concentric cam faces preferably made in the form of two concentric cams arranged coaxially with the head, each barrier arm being provided with a pair of cam followers cooperating with these concentrically spaced cams. The concentric cam elements 29 and 30 arranged within the cam head are carried by the cradle 18 and are fixed thereto by means of the screws or other securing means 31, 31. Each barrier arm is provided with a pair of cam followers, the barrier arm 13 with the cam followers 32 and 33, the barrier arm 14 with the cam followers 34 and 35, and the barrier arm 15 with the cam followers 36 and 37. The cam followers are suitably carried by brackets each provided with a pin received with a driving fit by a suitable bore formed in the axis portion of the barrier arm (see Fig. 6, the brackets and integral pins being designated by the reference character 38).

Referring now to Figs. 7 to 11 of the drawings showing the cam means depicted in detail, the two concentric cams 29 and 30 are each provided with a cam face having high, middle, and low points relatively arranged as clearly depicted in these figures. When a barrier arm (such as the arm 13) is in the passage-barring position (see Fig. 9) its cam followers (such as 32 and 33) are on the middle points of the cams 29 and 30, the cam follower 33 contacting the cam 29, and the cam follower 32 contacting the cam 30. When a barrier arm (such as the arm 14) is in one of its inactive positions (see Fig. 10) its cam followers (such as 34 and 35) are respectively on the high and low points of the cams 30 and 29 associated therewith. When a barrier arm (such as the arm 15) is in the other of its inactive positions, its cam followers (such as 36 and 37) are respectively on the low and high points of the cams 30 and 29 associated therewith. It will be noted particularly from Fig. 7 of the drawings, that the first quarter of the oscillating cycle is imparted to a barrier arm as the head is rotated over the first third of its rotation cycle, that the last or finishing quarter of the oscillating cycle is imparted to a barrier arm in the last third of the rotation cycle of the head, and that the intermediate half of the oscillating cycle (moving the arm between the extremes of its supplemental movement) is imparted to the arm during the intermediate third of its rotation cycle. In addition to the other advantages, it may be here noted that by reason of this action the arms are oscillated very gradually during the first quarter and last quarter of the oscillating cycle and are moved rapidly over the intermediate half of the oscillating cycle, thereby permitting an arm in passage-barring position to be moved in either direction (for a two-way operating turnstile) without causing the arms to bind. The cam followers, it will be noted, are arranged or separated both radially and circumferentially of the head to accomplish the desired results, the circumferential spacing resulting in holding each barrier arm stably against looseness in its oscillating socket. Thus smooth movement and firm stationary positions of the barrier arms are secured.

The other prime advantages obtained by means of this construction are more evident from Figs. 1, 2 and 4 of the drawings. When the arms 14 and 15 are in their inactive positions, they assume a more nearly vertical position and hence they do not materially project into and obstruct the turnstile passage. This enables the width of the stand *s* (as viewed in Fig. 2) to be made smaller and enables the maximum available width of the passage afforded by a barrier arm to be utilized. Stated collectively, this enables the greatest amount of space saving to be obtained, and stated corollarially it affords the use of a longer barrier arm (and a consequent wider passage) without increasing the over-all width of the turnstile. By reason of the supplemental movement of the arm as it is moved from a passage-barring position to its first inactive position, the arm moving away from its theoretical conical surface maintains its horizontal position longer and does not fall or drop away as quickly as in the case when the barrier arms are fixed to the head.

The controlling and operated parts of the turnstile are all housed by the casing *c*. Such parts may comprise the usual coin control devices, recording means, and an hydraulic silencer which automatically brings the arms to rest in the "home" position of the turnstile. Such means do not form a part of the present invention and are not shown herein in detail, some parts thereof, however, being depicted for illustrative purposes in Figs. 2 and 4 of the drawings. Here the turnstile shaft 11 is shown carrying a gear 40

which, associated with other means, prevents operation of the turnstile except upon depositing a coin, parts of the hydraulic silencer device for automatically bringing the turnstile to "home" position being also here shown. This comprises a spring-controlled arm **41** pivoted to a stud **42**, which arm cooperates with rollers **43**, **43** mounted in studs **44**, **44** fixed to the gear **40**, the cooperation being such that as a barrier arm is moved by the person passing through the passage, the arm **41** is put under tension so that as the person moves through the passage the tension of the arm **41** is exerted upon one of the rollers **43** to automatically bring the turnstile to rest in a "home" position. The rollers are also associated with an hydraulic-controlled lever **45** to ease and silence this automatic movement of the turnstile arms to their "home" position.

The structure, operation, and the many advantages of the turnstile of the present invention will in the main be fully apparent from the above detailed description thereof. It will be further apparent that while I have shown and described my invention in a preferred form, many changes and modifications may be made in the structure disclosed without departing from the spirit of the invention, defined in the following claims.

I claim:

1. A turnstile comprising a rotatable head mounted to rotate about an inclined axis, barrier arms carried by said head and spaced thereabout to lie on one side of said head, each barrier arm when in passage-barring position lying in an axial plane of said head, each such barrier arm being mounted in said head for a predetermined oscillation movement over a surface transverse to the said axial plane of the head, and mechanism for imparting a cycle of oscillation to each barrier arm as the head is moved through a cycle of rotation.

2. A turnstile comprising a rotatable head mounted to rotate about an inclined axis, barrier arms carried by said head and spaced thereabout to lie on one side of said head, each barrier arm being mounted in said head for an oscillation movement over a surface transverse to an axial plane of said head, and a cam means including fixed cam parts and cam followers attached to said barrier arms for imparting a cycle of oscillation to each barrier arm as the head is rotated.

3. A turnstile comprising a rotatable head mounted to rotate about an axis 45 degrees to the vertical, barrier arms carried by said head and spaced thereabout in generally conical formation, each barrier arm when in horizontal passage-barring position lying in an axial plane of said head, each such barrier arm being mounted in said head for a predetermined oscillation movement over a surface transverse to and crossing on opposite sides the said axial plane of the head, and mechanism for imparting a cycle of oscillation to each barrier arm as the head is moved through a cycle of rotation, the combined rotation and oscillation movement of the barrier arms being such that in a "home" position of the turnstile, arms not in passage-barring position are disposed inwardly of the axial planes associated therewith.

4. A turnstile comprising a rotatable head mounted to rotate about an inclined axis, three barrier arms carried by said head and spaced thereabout to lie on one side of said head, each barrier arm being mounted in said head for an oscillation movement over a surface transverse to and intersecting an axial plane of said head, and cam means for imparting a cycle of oscillation to each barrier arm as the head is moved through a cycle of rotation, the combined rotation and oscillation movement of the barrier arms being such that in a "home" position of the turnstile, the two arms not in passage-barring position are disposed inwardly of the axial planes associated therewith.

5. A turnstile comprising a support, a rotatable head mounted in said support to rotate about an inclined axis, barrier arms carried by said head and spaced thereabout in a surface of revolution, each barrier arm when in passage-barring position lying in an axial plane of said head, each such barrier arm being mounted in said head for an oscillation movement over a surface transverse to the said axial plane of the head, a cam carried by said support, a cam follower connected to each barrier arm and movable over said cam, said cam and cam follower operating to impart a cycle of oscillation to each barrier arm as the head is moved through a cycle of rotation.

6. A turnstile comprising a support, a rotatable head mounted on said support to rotate about an inclined axis, barrier arms carried by said head and spaced thereabout, each barrier arm when in passage-barring position lying in an axial plane of said head, each such barrier arm being mounted in said head for oscillation movement over a surface transverse to the said axial plane of the head, and means for imparting a cycle of oscillation to each barrier arm as the head is moved through a cycle of rotation, said means comprising a cam carried by said support having two concentric cam faces and a pair of cam followers connected to each barrier arm cooperating with the two concentric cam faces, each pair of cam followers being spaced both radially and circumferentially of said head.

7. A turnstile comprising a support, a rotatable head mounted on said support, barrier arms carried by said head and spaced thereabout, each barrier arm being mounted in said head for an oscillation movement over a surface transverse to a plane passing through the rotation axis of said head, and means for imparting a cycle of oscillation to each barrier arm as the head is moved through a cycle of rotation, said means comprising a cam carried by said support having two concentric cam faces and a pair of cam followers connected to each barrier arm cooperating with the two concentric cam faces, each pair of cam followers being spaced both radially and circumferentially of said head.

8. A turnstile comprising a support, a rotatable head mounted on said support to rotate about an inclined axis, barrier arms carried by said head and spaced thereabout in a surface of revolution, each barrier arm being mounted in said head for oscillation movement over a surface transverse to an axial plane of said head, and means comprising a cam on said support and cam followers on said barrier arms for imparting an oscillation movement to each barrier arm as the head is rotated, the combined rotation and oscillation movement of the barrier arms being such that in a "home" position of the turnstile, arms not in passage-barring position are disposed inwardly of the axial planes associated therewith.

9. A turnstile comprising a support, a rotatable head mounted in said support, barrier arms carried by said head and spaced thereabout, each barrier arm being mounted in said head for an oscillation movement, and means for imparting a cycle of oscillation to each barrier arm as the head

is rotated comprising, a cam carried by said support having two concentric cam faces and a pair of cam followers connected to each barrier arm cooperating with the two concentric cam faces, each pair of cam followers being spaced both radially and circumferentially of said head.

10. In a turnstile of the space-saving type having a rotatable head and barrier arms carried by said head with each barrier arm mounted in said head for an oscillation movement therein, means for imparting a cycle of oscillation to each barrier arm as the head is rotated comprising, a fixed cam having two concentric cam faces coaxial with the head and a pair of cam followers connected to each barrier arm cooperating with the two concentric cam faces, each pair of cam followers being spaced both radially and circumferentially of said head.

11. A turnstile comprising a rotatable head mounted to rotate about an inclined axis, barrier arms carried by said head and rotatable therewith, the barrier arms being disposed about said head in generally conical formation, each barrier arm being mounted in said head for a predetermined oscillation movement about an axis disposed radially of said head, and mechanism for imparting the oscillation movement to each barrier arm as the head is moved through a cycle of rotation.

12. A turnstile comprising a rotatable head mounted to rotate about an inclined axis, barrier arms carried by said head and rotatable therewith, the barrier arms being disposed about said head in generally conical formation, each barrier arm being mounted in said head for oscillation movement about an axis disposed radially and in the plane of said head, and cam means for imparting a cycle of oscillation to each barrier arm as the head is moved through a cycle of rotation.

13. A turnstile comprising a rotatable head mounted to rotate about an inclined axis, barrier arms carried by said head and spaced thereabout in the form of a cone, each barrier arm being mounted in said head for oscillation movement over a surface tangential to said cone, and cam means for imparting a cycle of oscillation to each barrier arm as the head is moved through a cycle of rotation.

14. A turnstile comprising a rotatable head mounted to rotate about an inclined axis, barrier arms carried by said head and rotatable therewith, each barrier arm being mounted in said head for a predeterimned oscillation movement about an axis intersecting the rotation axis, and mechanism for imparting a cycle of oscillation to each barrier arm as the head is moved through a cycle of rotation.

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