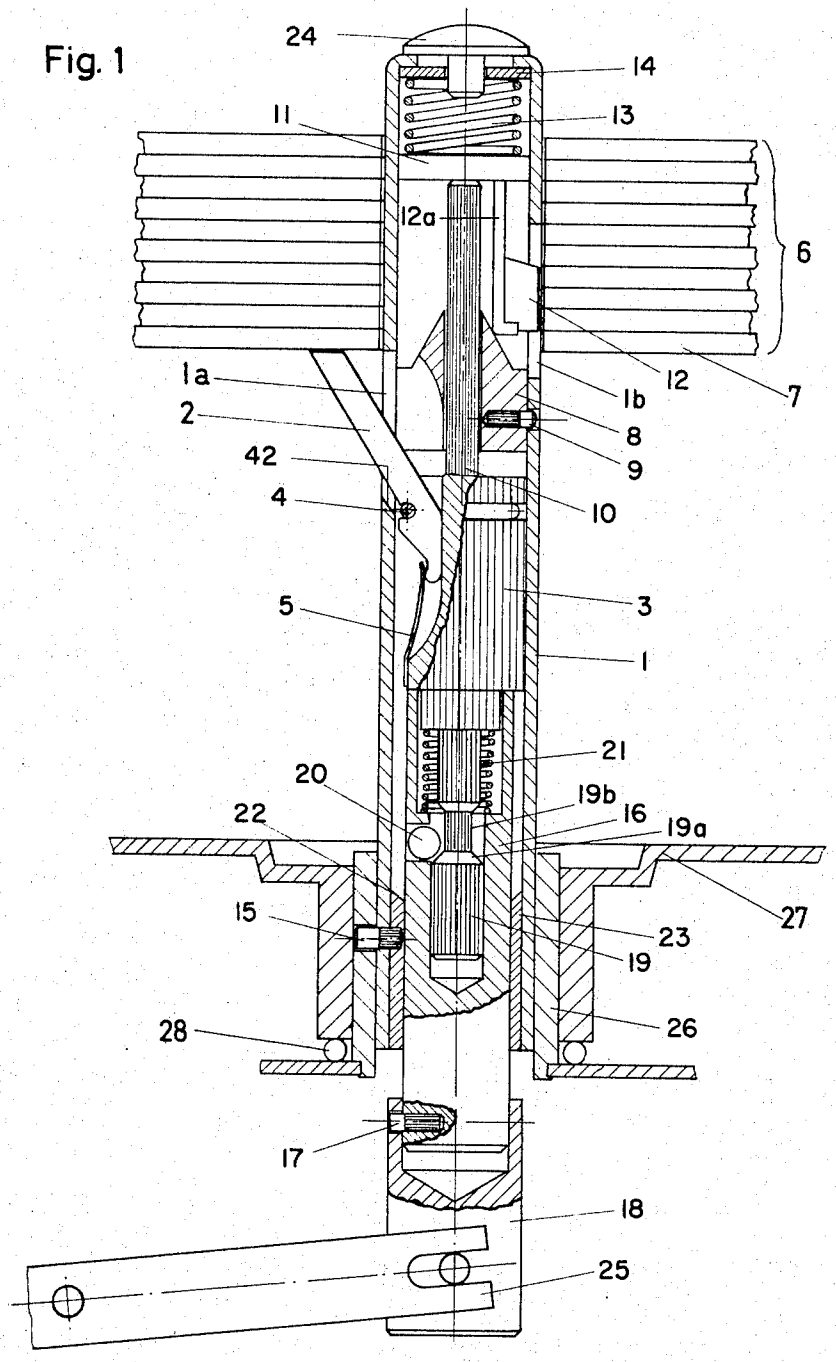
March 5, 1968 R. KIENINGER 3,371,935

STACKING ARBOR FOR AUTOMATIC RECORD CHANGERS

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Fig. 1



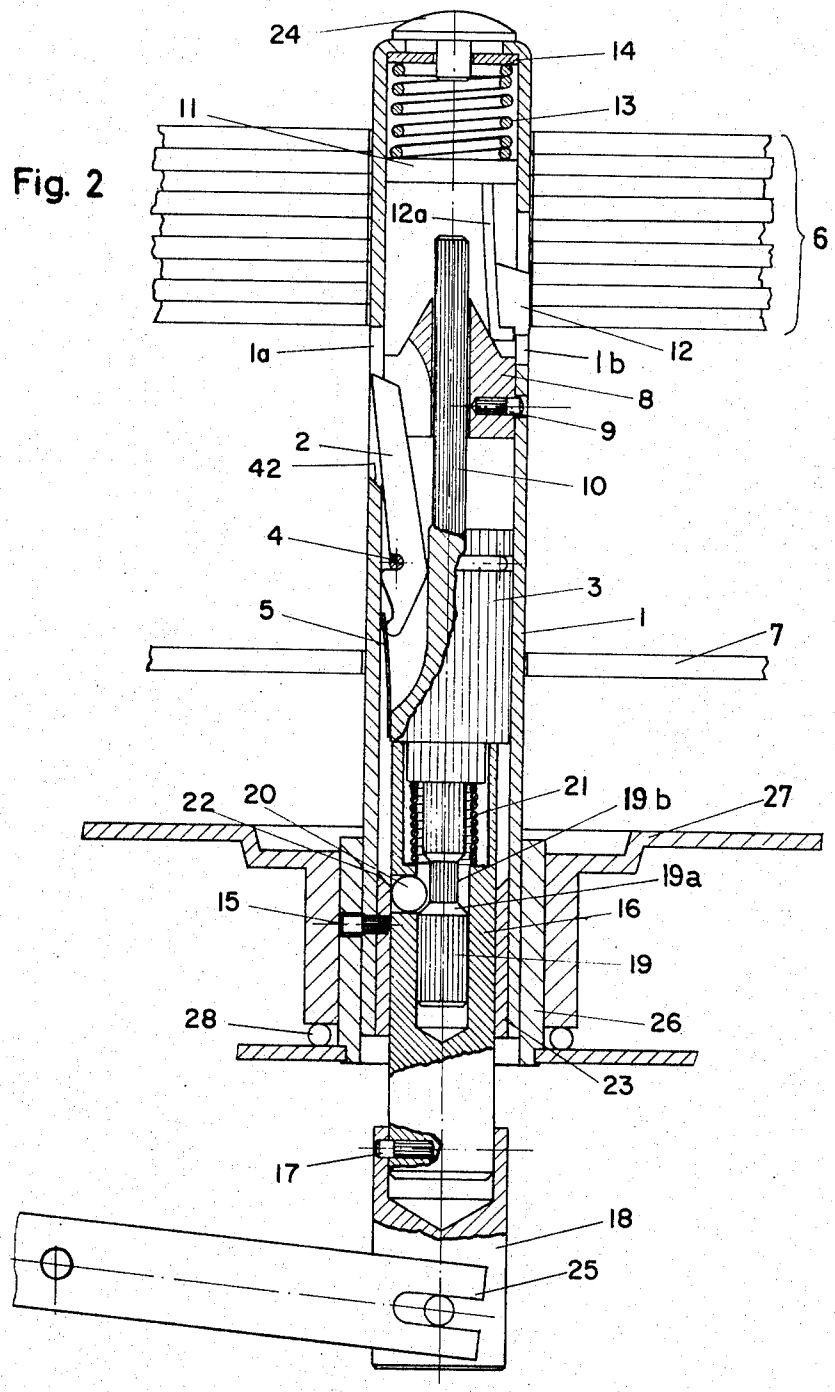
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STACKING ARBOR FOR AUTOMATIC RECORD CHANGERS

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Fig. 2



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STACKING ARBOR FOR AUTOMATIC RECORD CHANGERS

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Fig. 4

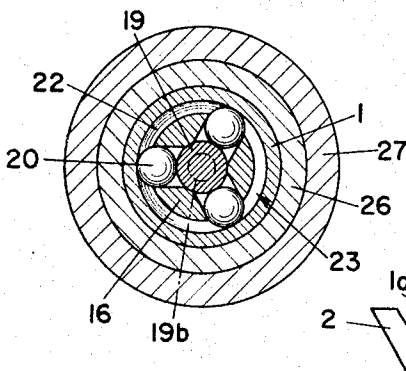


Fig. 3

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3,371,935

STACKING ARBOR FOR AUTOMATIC RECORD CHANGERS

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10 Claims. (Cl. 274—10)

ABSTRACT OF THE DISCLOSURE

A stacking arbor for an automatic record changer having clamping and supporting members movable radially and vertically relative to each other which are operated by control means located in the stacking arbor and movable between two end positions by the control mechanism of the record changer, and locking means which in the absence of any record on the stacking arbor are moved to a locking position in which the control means are locked in one of the end positions thereof to initiate stopping of the record changer.

In automatic record changers with a stacking arbor in which a new record on the arbor is released for movement onto the turntable after play of the preceding record has been finished, it is desirable, after the play of the last record has been finished, to stop the record player and to move the tone arm to an outer rest position. For this purpose it is necessary to provide the stacking arbor with sensing means which are actuated when the last record has moved onto the turntable to cause subsequently, after play of the last record, by means of an actuating mechanism stopping of the record player.

Known stacking arbors which are constructed to initiate stopping of the record player after the last record has been played and in which for instance in the interior of the stacking arbor a control rod is arranged which acts on control levers, have generally the disadvantage that the control movements carried out by the control members or sensing means are relatively short. These known constructions have to be, therefore, manufactured to very close tolerances, since otherwise a proper operation of the stopping mechanism cannot be assured. The manufacturing cost of these known stacking arbors is therefore relatively high. Various other stacking arbor constructions are also known in the art which are constructed to cause stopping of the record changer after the last record has been played, but these known constructions all have the disadvantages that only relatively short control movements will be produced by these constructions and in addition the known constructions are relatively complicated and not absolutely fool-proof.

It is an object of the present invention to provide for a stacking arbor of the aforementioned kind which avoids the disadvantages of known constructions of this type.

It is a further object of the present invention to provide for a stacking arbor which is constructed of relatively few and simple parts and which are arranged with respect to each other in such a manner so that a relatively large control distance is available for a stopping mechanism provided to stop the record changer.

With these objects in view, the stacking arbor according to the present invention for an automatic record changer mainly comprises stationary guide means for aligning a stack of records along an upright axis, control means guided by the guide means for reciprocating movement along the axis between two end positions and including a first member, support means carried by the first member

movable between an active position supporting the stack of records on the arbor and a releasing position releasing the lowermost of the stack of records for downward movement along the upright axis, means on the stationary guide means cooperating with the support means for moving the latter to the releasing position when the control means is moved from one to the other of the end positions, a second member abutting against the first member, and spring means operatively connected to the members and biased so as to tend to move the members in direction of the axis away from each other. The spring means have a spring force greater than the weight of the first member and the support means carried thereby, but smaller than the aforementioned weight and the weight of one record on the support means so that in the absence of a record on the support means the spring means will cause movement of the members relative to each other. The arrangement includes further moving means connected to the second member for moving the control means between the positions thereof so as to release during movement of the control means from the one to the other end position thereof, the lowermost of the stack of records, and locking means movable between an inactive position and a locking position preventing movement of the control means from the one to the other end position, the locking means being moved to the locking position thereof when the members are moved by the spring means a predetermined distance relative to each other while the control means is in the region of the one end position.

In a preferred embodiment the locking means comprise at least one ball located in a cut-out of the second member, which ball is moved by a guide face on the first member against a stationary abutment face when the members are moved under the influence of the spring means a predetermined distance relative to each other.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a partially sectioned side view of the stacking arbor according to the present invention, in which a stacking arbor is shown in a rest position supporting a stack of records;

FIG. 2 is a partially sectioned side view similar to FIG. 1 and showing the stacking arbor during release of the lowermost of the stack of records thereon;

FIG. 3 is a partially sectioned side view of the stacking arbor and showing the same in a position after the last record of the stack of records has been released; and

FIG. 4 is a cross section taken along the line 4—4 of FIG. 3 and viewed in the direction of the arrows.

Referring now to the drawings, and more specifically to FIG. 1 of the same, it will be seen that the stacking arbor according to the present invention mainly comprises stationary guide means in the form of a tubular member 1 connected at its lower end by means of a pin 15 to a bearing sleeve 26 which is fixedly connected in any convenient manner to the record player of which the stacking arbor of the present invention forms part. Control means are slidably arranged in the interior of the tubular member for reciprocating movement between an upper end position as shown in FIG. 1 and a lower end position as shown in FIG. 2. These control means include a first member 3 in the form of a guide bolt slidably guided in the interior of the tubular member 1. The member 3 carries support means for supporting a stack of records 6 aligned on the upper end of the stacking arbor along the

upright axis of the tubular member 1. The support means preferably comprise three support arms 2, only one of which is shown in FIG. 1, and the arms 2 are respectively displaced from each other through angles of 120° about the axis of the tubular member 1 and respectively extend, in the active position as shown in FIG. 1 in which the upper ends engage the bottom surface of the lowermost record 7 of the stack of records, inclined to the aforementioned axis through slots 1*a* formed in the tubular member. The arms 2 are hingedly connected in the region of the inner ends thereof to the member 3 by means of a ring 4 located in an annular groove in the member 3 and engaging in cutouts of each of the arms 2. The inner ends of the arms 2 are respectively arranged in substantially vertical slots formed in the member 3 and springs 5 fixed at the lower ends thereof to the member 3 in any convenient manner respectively engage the bottom ends of the arms 2 to press the latter in the region of the inner ends thereof against end faces of the aforementioned slots in the member 3 to yieldably hold the arms 2 in the active position as shown in FIG. 1. The lower end face 42 of each slot 1*a* through the tubular member 1 is preferably downwardly and inwardly inclined for a purpose which will be described later on.

The control means arranged in the interior of the tubular member 1 further comprise a second member 16 slidably arranged in a lower portion of the tubular member 1, projecting with a lower end portion thereof downwardly beyond the tubular member 1 and connected at the lower end thereof by means of a coupling pin 17 to a coupling sleeve 18. The coupling sleeve 18 forms part of the control mechanism of the record changer, otherwise not shown in the drawing, and the coupling sleeve 18 may be moved by means of a lever 25 also forming part of the aforementioned control mechanism upwardly and downwardly along the axis of the tubular member. The member 16 is formed with a central stepped bore extending from the upper end of member 16 into the latter and a downwardly projecting portion 19 integral with the member 3 slidably extends into the bore formed in the member 16.

The arrangement includes further locking means movable between an inactive position and a locking position preventing movement of the control means constituted by the members 3 and 16. The locking means may comprise three balls 20, only one of which is shown in FIG. 1 which are respectively rollingly arranged in three radial bores extending from the central bore in the member 16 to the outer surface thereof, angularly displaced from each other through angles of 120°.

The control means include further a soft coil compression spring 21 having a spring force greater than the weight of the member 3 and the support arms 2 connected thereto, but smaller than the aforementioned weight and the additional weight of at least one record supported on the support arms so that when at least one record is supported on the support arms the spring 21 will be compressed and the member 3 will rest with a shoulder face on the upper end face of the member 16, as shown in FIG. 1. In this position, a conical guide face 19*a* on the projecting portion 19 of the member 3 is positioned relative to the balls 20 as shown in FIG. 1 so that the balls may be located partly in the annular groove 19*b* provided in the projecting portion 19 between the ends thereof. The member 16 is slidably guided in a guide sleeve 23 secured in a lower portion of the tubular member 1 by the aforementioned pin 15 and the upper surface 22 of the guide sleeve 23 is an inwardly and downwardly inclined conical surface when cooperates with the ball 20 during downward movement of the member 16 to press the ball inwardly or to maintain the balls 20 in the inner position as shown in FIG. 1 when the member 16 is moved by the lever 25 in downward direction.

The stacking arbor includes further holding means for holding the stack of records 6 with the exception of the lowest record 7 in a fixed position in the region of the upper end of the tubular member during movement of the control means from the upper position, as shown in FIG. 1, to a lower position and simultaneous release of the lowest record 7 for downward movement along the tubular member 1 in a manner as will be described later on. The holding means include a camming member 8 having an upper substantially conical cam portion which is arranged in an upper portion of the tubular member 1 and fixedly held in place by a pin 9. The member 8 is formed with a central bore therethrough, through which a pressure rod 10 integral with, or fixed in any convenient manner to, the member 3, projects upwardly to engage with its upper end the bottom surface of a disk 11 slidably guided in the tubular member 1. Three clamping members 12, only one of which is shown in the drawings, are connected to the disk 11 by means of flexible holding arms 12*a* which are connected at the upper ends thereof to the disk 11 and at the lower ends thereof to the clamping members 12. The holding arms 12*a* abut with the inner lower ends against the conical cam face of the member 8. The clamping members 12 respectively extend with outer portions thereof through slots 1*b* formed, angularly displaced through angles of 120° from each other, in the tubular member 1. A coil compression spring 13 abuts with its lower end against the upper surface of the disk 11 and with its upper end against the bottom surface of a ring washer 14 so as to press the upper surface of the latter against an inwardly extending rim at the upper end of the tubular member 1. The spring or second biasing means 13 tends therefore to move the disk 11 in downward direction to cause thereby in cooperation with the conical cam face of the member 8 spreading of the lower ends of the arms 12*a* in outward direction and to press the outer surfaces of the clamping members 12 against the peripheral surfaces of the central bores of a plurality of lower records of the stack of records. In the position as shown in FIG. 1, the rod 10 prevents the spring 13 to move the disk 11 in downward direction.

A cap 24 preferably closes the upper end of the tubular member. A turntable 27 is turnably mounted on the outer surface of the sleeve 26 and supported at its lower end by a ball bearing 28.

The above-described stacking arbor according to the present invention will operate as follows:

The stacking arbor is shown in FIG. 1 in an upper end position. The lever 25 of the control mechanism holds by means of the coupling sleeve 18 the member 16 and the member 3 with the rod 10 in the position as illustrated in FIG. 1. The rod 10 engages with its upper end the disk 11 and holds thereby the clamping members 12 in a position retracted into the tubular member 1 so that the stack of records 6 is supported exclusively by the support arms 2.

FIG. 2 illustrates the relative positions of the various components of the stacking arbor during release of the lowermost record 7 from the stack of records on the upper end of the arbor. In this position the member 16 has been moved by the lever 25 to the lower end position thereof. The balls 20 have been moved during this downward movement of the member 16 by the conical face 22 on the upper end of the sleeve 23 to the inner position thereof and roll along the inner peripheral surface of the sleeve 23 so as to prevent by engagement with the conical surface 19*a* on the projecting portion 19 of the member 3 upwards movement of the member 3 relative to the member 16 which would otherwise occur under the influence of the force of the spring 21. The upper end of the pressure rod 10 is, during downward movement of the member 3, disengaged from the bottom surface of the disk 11 so that the latter moves downwardly under the influence of the force of the spring 13, so that the cone face on the camming member 8 spreads the lower ends of the flexible arms 12*a* in outward direction to press thereby the outer faces of the clamping members 12 forcefully against the peripheral surfaces of the

central bores of a plurality of lower records of the stack of records to hold thereby the stack of records, except the lowest record **7** of the original stack which is not engaged by the clamping members **12**, in fixed position in the region of the upper end of the tubular member **1**. During downward movement of the member **3**, the support arms **2** tiltably carried thereon will be moved by engagement with the surfaces **42** to their releasing position located entirely within the outer surface of the tubular member **1** so that the lowermost record **7** which is not engaged by the clamping members **12** can slide past the inwardly withdrawn supporting arms **2** downwardly onto the upper surface of the turntable **27**.

FIG. 3 illustrates the position of the various elements of the stacking arbor will assume after the last record has moved onto the turntable. In this position no records are supported on the supporting arms **2** and the member **16** is moved by the lever **25** a short distance downwardly, whereby the flexible arms **12***a* are under the influence of the spring **13** pressed downwardly until the lower ends thereof engage a shoulder on the camming member **8** to stop thereby the further downward movement of the disk **11** under the influence of the spring **13**. In this position, the spring **21** can move the member **3** upwardly relative to the member **16** as shown in FIG. 3. During this movement, the guide face **19***a* on the projecting portion **19** of the member **3** will press the balls **20** in radial outward direction and during further upward movement of the member **3** and the projecting portions **19** connected thereto the peripheral surface of the portion **19** below the guide face **19***a* will prevent a backward movement of the balls in radially inward direction. When now the lever **25** continues its downward movement which normally initiates release of a record and moves thereby the member **16** further downwardly, the balls **20** will engage with the abutment face **22** on the guide sleeve **23** and block in this manner a further downward movement of the member **16**. The lever **25** is thereby arrested after a short tilting movement in downward direction in the position shown in FIG. 3.

The end of the lever **25** which is hingedly connected to the coupling sleeve **18** executes during presence of records on the supporting arms **2** a control movement in the order of 5 to 10 mm. or more, as can be ascertained from comparison of FIGS. 1 and 2 while in the absence of a record the maximum control movement of the end of the lever **25** will be in the order of 2 mm. or less as is evident from comparison of FIGS. 1 and 3. In this way it is possible to obtain a control movement difference in the order to about 8 mm. which is available for control of the stopping mechanism of the record player. The mechanism by means of which stopping of the record player is obtained when the lever **25** is arrested in the position as shown in FIG. 3 does not form part of the present invention and this mechanism is therefore not shown in the drawing. This mechanism may comprise, in a known manner, a friction coupling or an elastic coupling element which, after blocking of the lever **25** in the position shown in FIG. 3, will initiate stopping of the record player.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of stacking arbors for automatic record changers differing from the types described above.

While the invention has been illustrated and described as embodied in a stacking arbor for an automatic record changer adapted to cooperate in a known manner with a stopping mechanism of the record changer to stop the latter after the last record on the stacking arbor has moved onto the turntable, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therfore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A stacking arbor for an automatic record changer comprising, in combination, stationary guide means for aligning a stack of records along an upright axis; control means guided by said guide means for reciprocating movement along said axis between two end positions, said control means comprising a first member, support means carried by said first member movable between an active position supporting the stack of records and a releasing position releasing the lowermost of the stack of records for downward movement along said upright axis, means on the stationary guide means cooperating with said support means for moving the latter to said releasing position when said control means is moved from one to the other of the end positions thereof, a second member abutting against said first member, and spring means operatively connected to said members and biased so as to tend to move said members in direction of said axis away from each other, said spring means having a spring force greater than the weight of said first member and said support means carried thereby but smaller than the aforementioned weight and the weight of one record on said support means so that in the absence of a record on said support means said spring means will cause movement of said members relative to each other; moving means connected to said second member for moving said control means between the positions thereof so as to release during movement of said control means from said one to said other end position the lowermost of the stack of records; and locking means movable between an inactive position and a locking position preventing movement of said control means from said one to the other end position thereof, said locking means being moved to said locking position when said members are moved by said spring means a predetermined distance relative to each other while said control means is in the region of said one end position.

2. A stacking arbor as defined in claim **1**, wherein said second member is formed with at least one cut-out, and said locking means comprise at least one ball located in said cut-out, an abutment face on said guide means, and a guide face on said first member arranged for pressing said ball against said abutment face during movement of said members under the influence of said spring means said predetermined distance relative to each other.

3. A stacking arbor as defined in claim **2**, wherein said guide means include a tubular member extending along said upright axis through central openings in the stack of records, said first and said second members being arranged in said tubular member coaxially with said axis.

4. A stacking arbor as set forth in claim **3**, wherein said support means comprises a plurality of arms hingedly connected at one end to said first member, said arms projecting in said active position of said support means inclined to said axis through slots in said tubular member beyond the outer surface of the latter, and biasing means cooperating with said arms to yieldably maintain the same in said active position.

5. A stacking arbor as defined in claim **3**, wherein said second member is formed with a central bore extending from the upper end thereof into said second member, and wherein said first member has a downwardly projecting portion extending into said bore.

6. A stacking arbor as set forth in claim 5, wherein said cut-out in said second member extends from said bore transverse to said axis to the outer surface of said second member, and wherein said guide face is provided on said projecting portion of said first member.

7. A stacking arbor as defined in claim 6, wherein said spring means is in the form of a coil compression spring located in said bore about said projecting portion of said first member.

8. A stacking arbor as defined in claim 3, and including holding means for holding the stack of records, with the exception of the lowest one, in fixed position on said tubular member during movement of said control means from said one to the other end position thereof and movement of said support means to said releasing position thereof.

9. A stacking arbor as defined in claim 8, wherein said holding means comprise a camming member having a cam face and being located in said tubular member fixedly connected thereto, clamping means engaging the cam face and arranged movably with respect thereto between an inactive position located entirely within said

tubular member and a clamping position extending in part through a slot in said tubular member into engagement with the stack of records, second biasing means engaging said clamping means and tending to move the latter to said clamping position, said first member having an upper portion cooperating, when said control means is in said one end position, with said biasing means to prevent the latter from moving said clamping means to said clamping position thereof.

10. A stacking arbor as defined in claim 3, wherein said moving means include a lever member pivotally connected to the lower end of said second member.

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