

A BoxBackground of the Invention

5 The present invention relates to a box, particularly though not exclusively, for holding magnetic discs of the type known as "floppy" discs.

10 Various boxes and containers are available for floppy discs. In particular a recently available box is in the form of a rectangular tubular sleeve. This box is provided with complementary dovetail formations on opposite sides of its sleeve whereby a plurality of boxes can be stacked side by side, or one above the next, in such a manner that they are interengaged and may be handled as one unit. One of these boxes is opened by pulling a drawer out from the sleeve.

15 Another floppy disc box is described in US Patent No. 4,356,918. This box has a "pouch" section hinged at one end to a base section. The pouch section is adapted to retain the floppy discs when upright. The base section can support the pouch section upright but only when the base section has been swung through 180° and the pouch section has been swung through somewhat more than 90°, both from a closed position of the box. This operation involving somewhat over 270° of relative movement requires dexterity to perform. Even when the pouch section is supported upright it must lean slightly back against the base section for stability. If it is inadvertently knocked forwards it can fall flat spilling the floppy discs.

30 Summary of the Invention

The present invention has been conceived as a box which is readily opened to a stable, self-supporting position.

A box according to the invention comprises:-

an outer part including two opposite side members and a top member,

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a drawer, including two opposite side members and a bottom member, the side members of the outer part and the side members of the drawer being arranged in two adjacent pairs of one outer-part side member and one drawer side member per pair; and

engagement means for interconnecting the drawer and the outer part so as to allow the drawer to be moved from a first closed position in which the drawer is closed by the outer part, to a second position wherein the drawer is partially withdrawn from the outer part, to a third position wherein the drawer is swung through an angle of less than 180 degrees with respect to the outer part, to a fourth self-supporting, open position, in which a rear lower edge of the outer part and a front lower edge of the drawer can abut a supporting surface; the engagement means comprising:-

a respective pin fixedly attached to one of each pair of side members so as to be positioned between its pair of side members,

a respective groove or slot extending in the other of each pair of side members for co-operating with the respective pin to interconnect the drawer and the outer part,

a stop at an end of each groove or slot for stopping movement of the drawer from its first to its second position, and

abutment means for stopping movement of the drawer into its fourth, open position;

each said pin abutting a longitudinal side of its slot or groove for defining a relative inclination of the drawer with the outer part in which the box is self-supporting in its fourth position.

Preferably the outer member is a sleeve.

When the box is open, contained objects, typically floppy discs, are displayed in the drawer with the box in its self-supporting, invert-V form. The discs can be readily thumbed through without risk of the opened box becoming

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unstable and spilling the floppy discs.

Although a respective slot could be provided in each of two opposite side members of the sleeve with a respective pin attached to each of two opposite side members of the drawer, the preferred arrangement, which facilitates a "draw-swing-moveback" action, is the provision of a respective groove in each side member of the drawer and a respective corresponding pin on the inside surface of each side member of the sleeve.

Preferably the arrangement is such that the drawer can be moved back through a certain distance after being swung, this distance being less than the original drawing distance. This requires provision of a second, abutment stop to limit the moving back distance. Although this stop could be provided by engagement of the sleeve and drawer elsewhere on the box, the stop is preferably provided alone or additionally by adaption of the pins and/or the grooves for the pins to engage in a stopped manner with the grooves at the required position. In a first embodiment, the adaption is in the form of the grooves being of greater width along the "moving-back" portion thereof. Additionally, the pins are conveniently of an aspect ratio such that they occupy the narrow width of the groove when the sleeve and drawer are aligned for drawing and they occupy substantially the full width of their grooves when the sleeve and drawer are swung for moving-back.

In a second embodiment, each groove in the respective side members of the drawer is hook-shaped, having a long branch occupied by its respective pin during withdrawing of the drawer from the sleeve, a transverse connecting section occupied by its pin during at least part of the swinging of the drawer with respect to the sleeve, and a shorter branch substantially parallel to the long branch and occupied by its pin during moving-back of the drawer.

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The shorter branches may be positioned above or below the longer branches, with the drawer oriented base-down. However, in the second embodiment described below with respect to the drawings, the shorter branches are positioned
5 below the longer branches since this enables the drawer and sleeve to be self-supporting with a larger angle between them. By analogy, the wider portion of the equivalent grooves in the box of the first embodiment could have been arranged to step wider at lower edges of the grooves rather
10 than to step wider at the upper edge as shown in my earlier application.

The box is preferably of moulded plastics material. The pins are preferably of squat U-shape. This has the twofold advantage of reducing their moulding-shrinkage-
15 causing bulk and of providing a more certain engagement with the stops formed by the step in width of the grooves as a result of the free corner of the step being accommodated in the gap between the arms of the U, at least in the first embodiment.

20 A further feature of the box of both embodiments is that the bottom of the sleeve is cut away in the region of the U-shaped pins moulded inside the sides of the sleeve to enable the sides to deflect outwards on springing of the pins into the grooves in the drawer for initial assembly of
25 the box.

The drawer is preferably provided with a restraining member for restraining the contents, usually floppy discs, from falling out forwards when the drawer is on end with the box in its open invert-V form. Although the restraining
30 member could be fixed to the drawer, possibly resiliently, it is preferably movable, conveniently pivotably, to an open position where at least some of the discs are restrained at an angle such as to lean forwards by a few degrees.

In the first embodiment, the forward edge of the res-
35 training member abuts the top of the front of the drawer.



In the second embodiment, the restraining member is so pivotally connected to the drawer that in the member's restraining position a forward edge of the restraining member abuts the flat surface. This is of advantage in that the restraining member not only restrains floppy discs displayed in the drawer from falling forwards out of the drawer, but also restrains the entire box from overbalancing forwards. This might otherwise happen with plastics-cased floppy discs, which are heavier than the cardboard-cased discs which the box of the first embodiment was designed to hold.

In the first embodiment, the restraining member may be freely movable to its restraining position. In the second embodiment it is preferably movable against friction whereby it more readily maintains its restraining position. Such friction could be achieved by means of a detent. However, it is preferably achieved by friction between pins engaging the restraining member with slots in the drawer. Preferably the web of the restraining member having the surface engaging edge co-operates with the top forward edge of the drawer in an over-centre manner during movement to its restraining position.

Preferably the said web of the restraining member is abutted on its underside by the said top forward edge of the drawer to transfer load to the restraining member when it is angled forward and acting to restrain. The sides of the restraining member may be cut away to enable such abutment.

The box is preferably provided with a catch arrangement whereby the drawer is held in when closed so that the box can be handled at random orientation without the contents being spilled. Conveniently, the catch is provided by means of an aperture in the sleeve being engaged by a detent on the drawer which is flexible for movement of the detent into its aperture. Where a restraining member is provided, it is conveniently made flexible with the detent provided thereon.

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Where the restraining member is clipped to the drawer by pins, for pivoting or for stopping pivot movement of the member, it is preferably additionally supported on the drawer so that the reaction forces during flexure for unclipping are not reacted by the pins.

To help understanding of the invention, first and second specific embodiments thereof will now be described with reference to the accompanying drawings in which:-

10 Description of the Drawings

Figure 1 is a side view of a box of the first embodiment of the invention;

Figure 2 is a plan view of the box of Figure 1;

Figure 3 is a side view with a drawer of the box of Figure 1 partially drawn from its sleeve;

Figure 4 is a side view with the drawer fully withdrawn swung and moved back until the box of Figure 1 has become self supporting;

Figure 5 is a top view of a box of the second embodiment of the invention;

Figure 6 is a bottom view of the box of Figure 5;

Figure 7 is a side view showing the box of Figure 5 during drawing of its drawer;

Figure 8 is a view similar to Figure 7 showing swinging of the drawer and the sleeve of the box with respect to each other;

Figure 9 is another similar view showing moving back of the drawer; and

Figure 10 is a further similar view showing the box of Figure 5 self-supporting on a surface.

First Embodiment

Referring first to Figures 1 to 4 and to in particular Figure 4, the box can be seen to consist of a sleeve 1, a drawer 2 and a restraining member 3, all three of moulded

polystyrene or ABS plastics material. Figures 1 and 2 show the drawer 2 contained within the sleeve 1 when the box is closed. A detent 4 on the restraining member 3 engages in an aperture 5 in the top 6 of the sleeve for holding the box closed. In this position the inner end of the drawer abuts a pair of abutments 33 in the sleeve whereby the sleeve is firmly located.

For opening of the box it is gripped and squeezed at grips 7, 8 provided opposite each other on the restraining member 3 and on the base of the drawer 2, the top and bottom members of the sleeve having cut-outs complementary to the grips. The drawer is effectively unbendable under this squeezing, having a reinforcing flat front face 9. However, the restraining member comprises an unreinforced web 10 extending from side to side of the drawer. This web 10 bends to release the detent 4 from the aperture 5 and to allow the drawer 2 to be withdrawn from the sleeve 1. The restraining member has opposite side members 11 which abut ledges 12 to react the gripping force. Front and back edges of the side members 11 are captive between the front face 9 and ridges 13 on the drawer, see Figure 3, whereby sliding forces on the restraining member 3 at the grip 7 are transmitted to the drawer.

The drawer 2 has side members 14, between which the restraining member sides 11 are accommodated, and a base member 15. The side members 14 are grooved on their outer surfaces with grooves 16 having a front "drawing-only" portion 17 and a rear "drawing and moving back" portion 18, the latter portion being wider. (The very front end of portion 17 is also wider but this is merely a moulding detail to maintain wall thickness constant; recesses 19 opposite ridges 13 are provided for the same reason.)

A pair of squat U-shape pins 20 are moulded on the insides of side members 21 of the sleeve 1. The pins 20 engage in the grooves 16, and retain the drawer attached to

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the sleeve, the grooves 16 stopping short of the inner ends of the side members 14. For initial engagement of the pins 20 in the grooves 16, the front ends of the sleeve side members 21 can be sprung out slightly, a cut-out 28 in the bottom member of the drawer facilitates this. The pins 20 have a greater length in the direction of withdrawal of the drawer than height transverse to this direction. This uneven aspect ratio will now be explained.

During initial withdrawal the pins 20 are accommodated in the "drawing-only" portion 17 of the grooves 16. When the drawer has been fully withdrawn, or at least so far that the angled inner end 23 of the drawer sides 14 can clear the top 6 of the sleeve, the pins 20 are able to turn in the wider portion 18 of the grooves 16. Thus the drawer 2 and sleeve 1 can be swung about the pins 20 until they are at the angle shown in Figure 4 when the drawer can be moved back until the pins come to rest on steps 24 formed where groove portions 17 widen into portions 18.

In this invert-V position, the box is self-supporting with the base member 15 of the drawer resting on the front edge 25 of the sleeve top member 6, the bottom member being indented to mate within the edge - see chain dotted lines 26 in Figure 2. The bottom 27 of the sleeve is cut away at 28 to accommodate the drawer. To fill the cut-out 28 when the box is closed, the base 15 of the drawer is stepped out at 29.

The restraining member 4 is free to pivot about the top edge 30 of the drawer front face 9 as far as the angle shown in Figure 4, i.e. 10° to the vertical, at which angle pins 31 on the restraining member side members 11 abut the ends of curved slots 32 in the drawer sides 14 whereby floppy discs supported in the drawer are restrained from falling forwards out of the drawer when they are being leafed through for selection.



Second Embodiment

The box of the second embodiment shown in Figures 5 to 10 of the drawings is generally similar to the box of the first embodiment. The features which are similar have the same numerals followed by an apostrophe. The features which are different have reference numerals 51 upwards. The box consists of a sleeve 1', a drawer 2' and a restraining member 3'. A detent 4' on the restraining member 3' engages in an aperture 5' in the top 6' of the sleeve for holding the box closed.

For opening of the box it is gripped and squeezed at grips 7', 8' provided opposite each other on the restraining member 3' and on the base of the drawer 2', the top and bottom members of the sleeve having cut-outs complementary to the grips. The back edge of each side member 11' of the restraining member 3' abuts a respective ridge 13' on the drawer and the front edge of the web 10' abuts the inner surface of the face 9' until the web 10' is moved to its restraining position (see below), whereby sliding forces on the restraining member 3' at the grip 7' are transmitted to the drawer.

The drawer 2' has side members 14', between which the restraining member sides 11' are accommodated, and a base member 15'. The side members 14' are grooved on their outer surfaces with grooves 16'. As best shown in Figure 10, the grooves 16' are hook-shaped, each having a long branch 51, a transverse connecting section 52 and a short branch 53. The front end of the long branch is open at the flat front face 9' of the drawer. However, when the box is closed, a respective one of a pair of squat U-shape pins 20' moulded on the insides of the side members 21' of the sleeve 1' closes each long branch 51 at the front face 9', the pins 20' being provided at the front edges of the side members 21'. The long branches 51 extend back along substantially the entire length of the side members 14' of the



drawer 2' and have upwardly tapering rear end sections 54. Extending downwards and slightly forwards from the sections 54 are transverse connecting sections 52 leading to forwardly extending short branches 53 arranged below the long branches 51. The forward end 55 of the short branches is angled as will be explained below. The sides 14' of the grooves are provided with recesses 56 for maintaining the wall thickness constant.

As mentioned, the pins 20' engage in the grooves 16' and retain the drawer 2' attached to the sleeve 1'. For initial engagement of the pins 20' in the grooves 16' the forward ends of the sleeve side members 21' can be flexed outwards. This is facilitated by the provision of angled cut-outs 57 (see Figure 6) in the bottom of the sleeve, which leave triangular portions of the sides 21' unreinforced and hence sufficiently flexible for springing of the pins 20' into the grooves 16'.

On initial drawing of the drawer 2' from the sleeve, see Figure 7, the pins 20' pass along the long branches 51 of the grooves 16'. On reaching the rear end of the grooves, the pins 20' are accommodated in the transverse connecting sections 52. The sleeve 1' and the drawer 2' are then angularly swung in the direction of the arrows S in Figure 8. If the swinging action is started before the drawing action is complete, the long diagonal dimension across the pins 20' is accommodated across the long branches 51 by the tapering sections 54. The swinging action is accompanied by a transverse movement of the sleeve and drawer so that the pins align with the short branches 53 of the grooves 16'. Then, as shown in Figure 9, the drawer is moved back on itself with the pins 20' passing along the short branches 53 until they abut their angled forward ends 55. These ends are so angled that the twin abutments 58 of each U-shaped pin 20' both abut the respective end 55. The box is then arranged for self-support on a surface 59, see Figure 10.



In this invert-V position the base member 15' of the drawer at a recess 26' mates with the front edge 25' of the sleeve top member 6'. The angle between the sleeve and the drawer is typically 74°.

5 Once the box is open, the restraining member 3' can be opened to its restraining position as also shown in Figure 10. It has pins 31' moulded integrally with the restraining member side members 11'. The pins are accommodated in slots 32' in the drawer side members 14'. The slots 32' extend
10 transversely of the drawers' length. A U-shaped aperture 60 extends - from close to the bottom rear end of each slot - back, up and forwards over its slot 32' giving the slot a slight resilience in its width, whereby the pin 31' accommodated in it is frictionally held at least when at the
15 "upper" end 61 of the slot 32'. As the restraining member 3' is opened by being moved away from the drawer in the direction of the arrow B, its forward end 62 which is angled will ride over the top front edge 63 of the drawer. As the restraining member is opened further, its pins 31' will move
20 to the "upper" ends of the slots 32' where they are frictionally held. As the portion of the web 10' of the restraining member adjacent the forward edge 62 passes over the edge 63 it does so in an over-centre manner, with the slot 31' resiliently opening slightly and the web 10' flexing
25 slightly. Then the forward end 62 passes under the edge 63 to abut the surface 59. The side members 11' are cut away at 64 to provide with the web 10' a corner location for the edge 63. This position of the restraining member is stable, whereby floppy discs 65 leant against the restraining member,
30 as shown in dotted outline in Figure 6, do not over-balance forwards the entire box.

Closure of the box is effected by reversing the steps described above.

The invention is not intended to be restricted to the
35 details of the above described embodiments. The position

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of the pins and grooves in the second embodiment could be altered up or down, but their position spaced from both top and bottom members of the sleeve is found to give a good compromise between clearance for sliding and stability.

5 Attention is drawn to patent No. 2,140,781, granted on application No. 8412583 from which this patent's application No. 8613992 is divided, which patent claims matter disclosed in this patent.

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CLAIMS

1. A box for holding thin objects, the box comprising:-
an outer part including two opposite side members and a
5 top member,

a drawer, including two opposite side members and a
bottom member, the side members of the outer part and the
side members of the drawer being arranged in two adjacent
pairs of one outer-part side member and one drawer side
10 member per pair; and

engagement means for interconnecting the drawer and the
outer part so as to allow the drawer to be moved from a
first closed position in which the drawer is closed by the
outer part, to a second position wherein the drawer is
15 partially withdrawn from the outer part, to a third position
wherein the drawer is swung through an angle of less than
180 degrees with respect to the outer part, to a fourth
self-supporting, open position, in which a rear lower edge
of the outer part and a front lower edge of the drawer can
20 abut a supporting surface; the engagement means comprising:-

a respective pin fixedly attached to one of each
pair of side members so as to be positioned between its
pair of side members,

a respective groove or slot extending in the other
25 of each pair of side members for co-operating with the
respective pin to interconnect the drawer and the outer
part,

a stop at an end of each groove or slot for
stopping movement of the drawer from its first to its
30 second position, and

abutment means for stopping movement of the drawer
into its fourth, open position;

each said pin abutting a longitudinal side of its
slot or groove for defining a relative inclination of
35 the drawer with the outer part in which the box is
self-supporting in its fourth position.



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2. A box as claimed in claim 1, wherein the movement of the drawer from its third to its fourth position includes a translational movement during which the said relative inclination of the drawer with the outer part is determined in co-operation with the said abutment of each said pin by abutment of a front edge of the top member of the outer part, or a front edge of a bottom member of the outer part, with the bottom member of the drawer.

3. A box as claimed in claim 1 or claim 2, wherein each slot or groove comprises a groove having a first elongate portion for guiding at least part of the drawer's travel between the first and second positions, and each groove having a second portion connected to the first groove portion, the second portion having at least first and second terminating ends, the first end defining the said stop to prevent further withdrawal of the drawer from the outer part by abutment of a corresponding pin against this first stop, and the second end defining a second, abutment stop to prevent the drawer from further movement beyond the fourth position when the drawer is in the third, swung, position, the second portion of the groove having a width transverse to its longitudinal length that is greater than the maximum cross-sectional dimension of the respective pin so as to allow the drawer, when in at least the second position, to be swung with respect to the outer part into the third position, and to further allow the drawer, when in the third position, to be moved in the second portion of the groove in a direction away from the first terminating end until the respective pin contacts the second stop defined by the second terminating end of the second groove portion.

4. A box as claimed in claim 3, wherein the said outer part is a sleeve having a bottom member and the arrangement is such that in the fourth, self-supporting position the bottom member of the drawer abuts the top or



the bottom member of the sleeve and co-operates with the pins in abutting the longitudinal sides of the slots to define the relative inclination of the drawer with the sleeve in the fourth self-supporting position.

5 5. A box as claimed in any preceding claim, wherein:-
the said outer part is a sleeve having a bottom member;
each pin is provided on the inside of its respective
sleeve side member; and
10 each groove extends along its respective drawer side member.

6. A box as claimed in any preceding claim, wherein the engagement means provides pivotal interconnection of the sleeve and the drawer and the swinging movement is a simple pivotal movement.

15 7. A box as claimed in any one of claims 1 to 5 wherein each groove second portion is wider than the respective pin so that the engagement means provides a pivotal connection such that the swinging movement is a pivotal movement accompanied by a movement transverse to the grooves.

20 8. A box as claimed in claim 5 or either of claims 6 and 7 as appendant to claim 5, wherein the box is of moulded plastics material, the pins are integrally moulded on the inside surface of the respective side members of the sleeve and the grooves or slots are integrally moulded as grooves
25 in the outside surfaces of the respective side members of the drawer.

9. A box as claimed in claim 9 wherein a bottom member of the sleeve is cut away in the region of the pins to enable the side members of the sleeve to deflect outwards
30 on springing of the pins into the grooves in the side members of the drawer for initial assembly of the box.

10. A box as claimed in claim 8 or claim 9, wherein the first portion of each groove has a width less than the width of the second groove portion and further wherein the
35 pins have an aspect ratio such that they occupy substantially



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the full width of the groove first portion's width and further wherein the pins substantially occupy the full width of the second groove portion's width during movement of the drawer with respect to the sleeve between the third and fourth positions of the engagement means.

11. A box as claimed in claim 10, wherein the first and second portions of the respective grooves are connected to form a step junction, the step junction forming the second stop to prevent the drawer from further movement beyond the fourth position.

12. A box as claimed in claim 8 or claim 9, wherein each groove in the respective drawer side members is hook-shaped, and has:

a long branch defining the first groove portion that is occupied by its respective pin during withdrawal of the drawer from the sleeve between at least a portion of the first and second positions,

a transverse connecting section forming part of the second groove portion that is occupied by its pin during at least part of the swinging of the drawer with respect to the sleeve as the drawer is moved from its second position to the third position, and

a shorter branch substantially parallel to the long branch, the shorter branch forming part of the second groove portion, the shorter branch occupied by its pin during movement of the drawer from the third position to the fourth position.

13. A box as claimed in claim 12, wherein the short branches of the grooves are positioned on the drawer-bottom-side of the long branches.

14. A box as claimed in claim 12 or claim 13, wherein the short branches of the grooves are wider than the long branches and the pins have an aspect ratio such that they occupy substantially the full width of the long branches during withdrawing of the drawer and they occupy substan-



tially the full width of the short branches during moving back of the drawer after swinging of the drawer and the sleeve with respect to each other.

15. A box as claimed in claim 12, claim 13 or claim 14, wherein the stops are formed by the ends of the short branches remote from the transverse connecting sections with which the pins co-operate to stop further movement of the drawer with respect to the sleeve as the drawer is moved from the third to the fourth positions.

16. A box as claimed in any one of claims 12 to 15, wherein the long branch of each groove tapers away from the short branch in the region of the transverse connecting section.

17. A box as claimed in any one of claims 8 to 16 wherein the pins are U-shaped in cross-section parallel to the side of the sleeve.

18. A box as claimed in any one of claims 8 to 17, wherein a recess is provided in the bottom member of the drawer to co-operate with the top member of the sleeve when the pins abut the second stop.

19. A box as claimed in any preceding claim including a restraining member for restraining the objects from falling out of the box in its fourth, self-supporting open position.

20. A box as claimed in claim 19, including pivotal connection means for pivotally connecting the restraining member to the drawer about an axis in a front portion of the drawer and pivotal limitation means for limiting forward pivotal movement of the restraining member, whereby the restraining member has a forwards inclination in its restraining position when the box is in its open, fourth, self-supporting position supported on a flat surface.

21. A box as claimed in claim 20, wherein the axis of pivotal connection is at the top edge of a front member of the drawer.



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22. A box as claimed in claim 20, wherein the axis of pivotal connection is so positioned in the side members of the drawer that a forward edge of the restraining member abuts the flat surface, when in its restraining position with the box open, for steadying of the box against tipping forward under the weight of the restrained objects.

23. A box as claimed in claim 22, wherein a web of the restraining member having the said forward edge co-operates with the top front edge of the drawer in an over-centre way and/or the axis of pivotal connection of the restraining member to the drawer deflects during movement of the restraining member from a position partially closing the drawer when the box is closed to its surface abutting/restraining position.

24. A box as claimed in any one of claims 19 to 22, wherein the restraining member includes a web, side members extending from the web inwardly of the drawer adjacent the side members of the drawer, each side member of the restraining member having a pin engaged in a respective aperture in the respective drawer side member.

25. A box as claimed in claim 23 as appendant to claim 21 wherein the drawer side member apertures are arcuate slots to permit the pivotal movement of the restraining member about the top front edge of the drawer and to limit movement of the restraining member by abutment of each pin with an end of its slot.

26. A box as claimed in claim 23 as appendant to claim 21 or claim 22 wherein the drawer side slots extend transversely of the length of the drawer side members to permit transverse deflection of the pins on movement of the restraining member.

27. A box as claimed in claim 25 wherein the upper end of each drawer side member slot is resilient.

28. A box as claimed in claim 25, or claim 26, wherein the restraining member is limited by abutment of a forward



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edge of each web with the inside of the front member of the drawer.

29. A box as claimed in any one of claims 19 to 28 wherein the restraining member is resilient and provided with a detent for engaging in an aperture in a top member of the sleeve for holding the box closed, the restraining member being flexed for disengagement of the detent from the aperture and for opening of the box.

30. A box as claimed in claim 29 as appendant to any one of claims 24 to 28 wherein the restraining member side members abut the drawer on flexure of the restraining member for opening of the box.

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