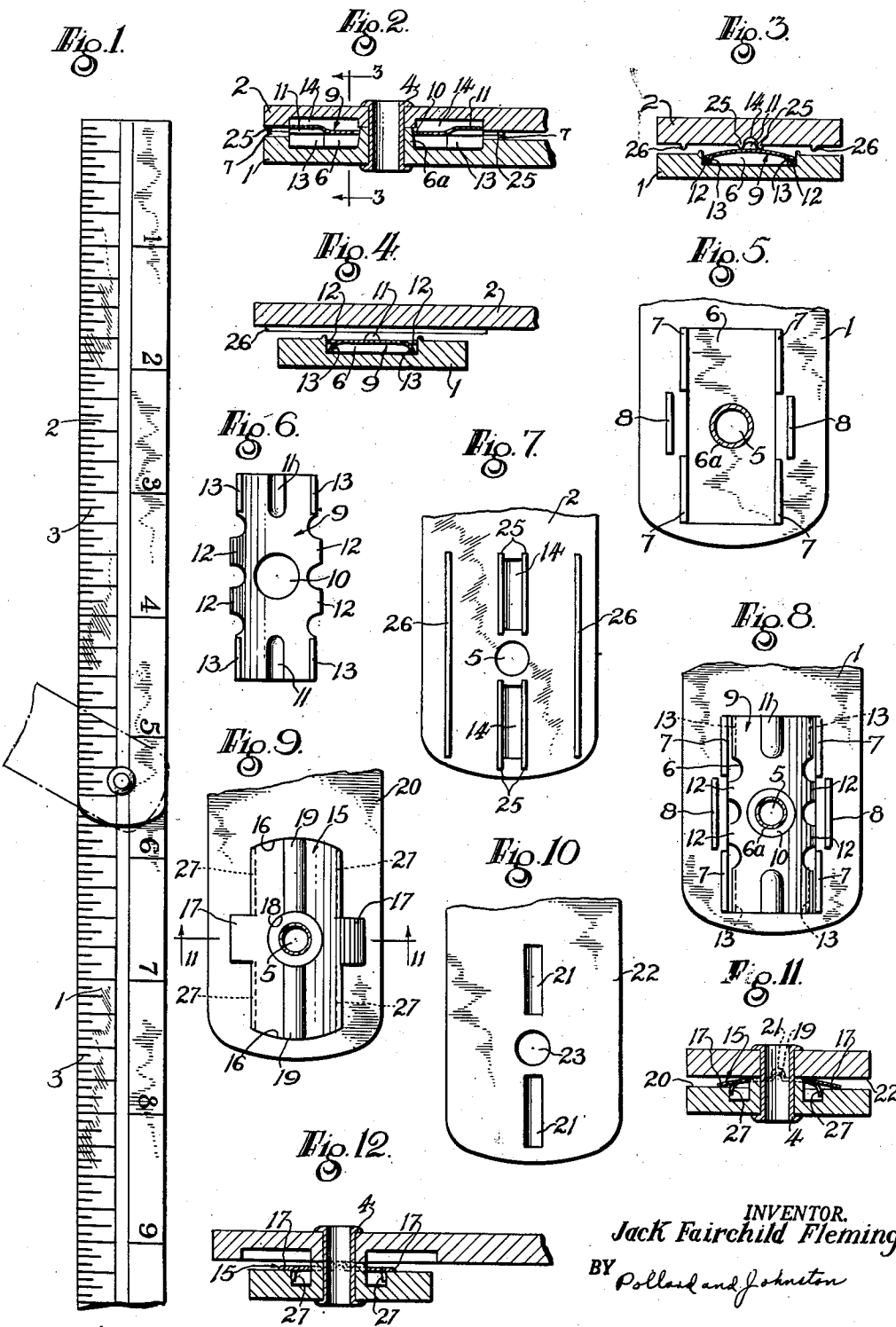


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PLASTIC FOLDING RULER
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PLASTIC FOLDING RULER

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1

This invention relates to folding rulers and more particularly to sectional rulers of the folding type made principally of a molded plastic material and especially useful to housekeepers, carpenters, mechanics and others for making accurate measurements.

A principal object of the present invention is to provide an inexpensive folding ruler construction which embodies simple and effective means for holding the sections of the ruler in folded and extended positions.

Another object of the invention is to provide a folding ruler construction which enables the efficient use of molded plastic compositions as the main structural material for rulers of this type.

Another object is to provide a joint between the ruler sections that will absorb strains and thereby protect plastic sections against injury in the turning of said sections about their pivots.

Another object is to provide a locking joint between the sections that is compact, simple and works smoothly with balanced stresses.

Other objects and advantages of the invention will be apparent from the description thereof to follow taken in connection with the accompanying drawing in which:

Figure 1 is a fragmentary plan view showing two adjoining sections of a folding ruler in an extended position;

Figure 2 is a longitudinal cross-section through the joint with the two sections in folded position;

Figure 3 is a transverse sectional view of the same structure, taken on line 3—3 of Figure 2;

Figure 4 is a similar view showing the relative positions of the parts when one section is partially extended at a right angle to the other;

Figure 5 is a fragmentary plan view showing the formation of one end face of a ruler section;

Figure 6 is a bottom plan view of a spring plate which is to be assembled into a recess of the end formation shown in Figure 5;

Figure 7 is a fragmentary plan view showing an end face of another ruler section which is to be joined foldably to the structure shown in Figure 5;

Figure 8 is a view similar to Figure 5, but showing the spring plate of Figure 6 in seated position;

Figure 9 is a fragmentary plan view showing a spring plate seated in a recessed end face of a ruler section, according to a modified form of the invention;

Figure 10 is a fragmentary plan view of one end face of a ruler section adapted to be joined foldably to the structure of Figure 9;

Figure 11 is a transverse sectional view through an assembly of the elements shown in Figures

2

9 and 10, the ruler sections being in folded relationship and the view being taken approximately at line 11—11 of Figure 9;

Figure 12 is a view similar to Figure 11 but in which one of the joined sections extends approximately at a right angle to the other.

Referring to the drawing in detail and particularly to Figures 1—8, which show a preferred embodiment of the invention, the ruler comprises a plurality of sections, such as shown at 1 and 2. Each section has a flat elongated body formed of plastic material, such as synthetic resin, molded in the desired form. Each section is provided along the margins of both faces with suitable divisions or markings corresponding to units of measurement, as indicated at 3. The two sections at extreme ends of the folding ruler have end face formations like those shown in Figure 5 and Figure 7, respectively, while intermediate sections of the ruler each have one end face formed as shown in Figure 5 and another end face, on the opposite side and opposite end of the same section, formed as shown in Figure 7. Thus, any two sections can be assembled together with end portions overlapping so that a recessed formation (like that of Figure 5) on one section faces a grooved formation (like that of Figure 7) on another section. When a spring plate such as that shown at 9 or 15 is suitably positioned between the overlapping end portions, these can be pivotally interconnected to obtain the desired frictional folding joint simply by inserting and heading over an eyelet or rivet 4 which passes transversely through openings 5 in the connected parts. Each section then can be rotated relative to another by movement in its own plane about the axis of the pivot 4.

The illustrated end face formation of section 1 consists principally of a generally rectangular recess 6 formed integrally in the molded plastic body of the ruler section. In the center of the recess is a raised pivot boss 6a extending above the surface level of section 1 and having at its upper end a flat surface adapted to engage the adjacent section 2. The height of this boss determines the clearance between the overlapping end portions at the pivotal joint. The opening 5 passes through the center of the pivot boss.

A resilient plate 9 of thin spring metal is seated in the recess 6 and interposed between said recess and the opposed face of the end of the adjacent section, for example section 2. The plate has a rectangularly shaped body which is bowed or cambered transversely over the length of the body and is formed with a central opening 10 through which rivet 4 passes. The central portion of the

body which contains this spring is straddled by spring portions formed to exert the desired working pressure on the adjoining sections. Along the longitudinal axis of these spring portions are elongated protruding portions or humps 11, 11 pressed outwardly from the plane of the body. In spaced relation on each side of the plate adjacent the center thereof are laterally extending abutments 12, 12. The side edges of each spring portion are bent away from the plane of the body in a direction opposite to the humps 11, 11 and form side flanges 13, 13. The side flanges in this embodiment of the invention are spaced apart a distance smaller than the width of the recess 6 and thus they enter easily into the recess and rest on the bottom thereof with clearance from its side walls permitting the flanges to spread apart on the recess bottom when the spring plate is compressed. The laterally extending lugs 12, 12 hold the plate against rotation by abutting against the side walls of the recess just below the upper edges thereof.

The end face of ruler section 2 as seen in Figure 7, is formed with elongated grooves 14, 14 on opposite sides of its central opening 5. Along both sides of the grooves are ridges 25, 25. The grooves receive the elongated humps 11, 11 of plate 9 and cooperate to interlock the sections and yieldingly hold them in either the completely extended position of Figure 1 or the folded position of Figure 2, against accidental relative rotation. Parallel to the ridges 25, 25 and adjacent the margins of the grooved face of section 2 are ridges 26, 26.

The recessed face of section 1 also is provided with ridges. Along the end portions of each side edge of the recess are ridges 7, 7. A parallel ridge 8 lies on the section face midway between each side edge of the recess and the corresponding side edge of the section and is of a length sufficient to bridge the gap between the ridges 7, 7.

In use, it will be understood that the ruler is movable in the manner of the conventional folding rulers of this type by holding one section, for example, section 1, and turning the other section about the rivet 4 as a pivot. This movement of section 2 starts the grooves 14, 14 away from interlocked relation with humps 11, 11 as shown in Figure 3 and forces the latter downward thereby depressing the spring portions of the resilient plate slightly as shown in Figure 4. It should be noted that as flanges 13, 13 do not normally bear against the side walls of the recess 6, they are free to spread laterally over the bottom of the recess as the plate is compressed.

During the turning movement of section 2, ridges 25, 25 and 26, 26 serve as bearing surfaces by riding on the humps 11, 11 of the resilient plate 9. The friction produced by pressure of the humps against the ridges on the adjacent face of section 2 is always sufficient to hold the two sections against accidental relative rotation.

In Figures 9-12, a modified form of the invention is shown comprising ruler sections of the type already described having end faces 20 and 22 to be assembled in face to face relation with a resilient plate 15 therebetween. The recessed end face 20 is generally similar to that of Figure 5 but is here shown as being formed with a rectangular recess having somewhat rounded ends and as lacking the ridges 7 and 8 of Figure 5. The grooved end face 22 has elongated grooves 21 formed therein at opposite sides of pivot opening 5.

Seated in the recess in end face 20 is the resili-

ent plate 15. The plate has a rectangularly shaped body portion of thin spring metal which is cambered transversely throughout its length and has slightly rounded longitudinal end edges 16. An opening 18 is centrally formed in the body portion through which passes a raised pivot boss on end face 20 similar to the raised pivot boss on section 1 of Figures 1-8. Extending from the opening to each end of the body portion along the crest of the camber is an elongated protruding portion or hump 19 pressed outwardly from the body of the plate. An extension or tongue 17 extends laterally in the arc of the camber from midway of the ends of each longitudinally extending side of the body and rests on an adjacent portion of end face 20. Depending from the side edges on both sides of the laterally extending tongues 17 are flanges or abutments 27 which resiliently engage the side walls of the recess and hold the plate against rotation. Side flanges or abutments 27 normally do not extend to the bottom of the recess and thus may engage in to-and-fro movement with respect to the bottom.

The protruding portions 19 on plate 15 project into the elongated grooves 21 in the end face 22 so as to interlock the ruler sections in either extended or folded positions. End face 22 also has an opening 23 through which passes the rivet holding the sections together.

Ruler sections having end faces 20 and 22 are moved to extended, folded and angular positions in the same manner as sections 1 and 2 disclosed in Figures 1-8. Upon rotation of the section having end face 22 relative to the section having end face 20, humps 19 are forced downward depressing the cambered plate 15 clear out to the ends of the laterally extending abutments 17 as may be best seen by comparing Figures 11 and 12. Side flanges 27 move downward as the plate is depressed, yet at all times restrain the plate from rotating in the recess.

As the pressure on the parts in each of the embodiments is equal and equally balanced about the rivet 4, there is no straining apart of the sections and no racking or twisting of the sections at the point of pivot. The ruler is therefore firmly locked in either closed or straight open positions and frictionally held in the intermediate positions.

It is to be understood that the detailed description and accompanying drawings are illustrative only and that the improvements herein disclosed may be embodied in various forms of construction within the scope of the appended claims, as will be apparent to those skilled in the art.

What I claim is:

1. A folding ruler comprising a plurality of elongated sections of molded synthetic resin having overlapping ends pivotally connected together for relative rotation on an axis transverse to said ends, one of said overlapping ends of each pair having a recess molded in one face, the other overlapping end having spaced grooves molded in its adjacent face, a spring plate mounted in said recess between and in contact with the adjacent faces of said overlapping ends, said plate having compressible protruding portions cooperating with said spaced grooves for holding the sections against relative rotation, said grooved face having integrally molded ridges projecting from the face thereof which ride on said protruding portions of the plate upon relative pivotal movement between the sections.

2. A folding ruler comprising a pair of elongated sections having overlapping ends pivotally

5

connected together, one of said overlapping ends having a recess in one face and an opening therethrough, the other overlapping end having an opening therethrough and indentations on opposite sides of said opening on the adjacent face thereof, a resilient means seated in said recess and having an opening therethrough and raised portions on opposite sides of said opening for interlocking engagement with the indentations on said other overlapping end, a pivot boss portion encompassing the opening on one of said ends and extending through the opening in the resilient means into seating engagement about the opening in the adjoining end section and effective to determine the distance that the adjacent faces of the overlapping ends may be brought together, and a fastening means extending through the openings in the end sections whereby the resilient means is held in partly compressed condition between the overlapping ends and the raised boss portion on one section is held in seated relation about the opening in the adjoining end section.

3. A spring plate for holding lapped ends of ruler sections or the like against relative rotation comprising a sheet metal body to extend longitudinally on a face of one section in engagement with the adjacent face of another section, said body having a central portion and spring portions at opposite sides of the central portion, said spring portions each being cambered transversely and formed with an elongated hump protruding therefrom along the crest of the camber, each spring portion having flanges along opposite sides thereof protruding therefrom in a direction substantially opposite to that of said humps, and laterally extending members on opposite sides of said central portion lying generally in the plane thereof.

4. A folding ruler comprising elongated substantially flat ruler sections formed of molded plastic material and having portions of their adjacent ends overlapping and pivotally connected together for relative rotation on an axis transverse to the overlapping end portions, and a compressible spring plate between and in contact with the adjacent plastic material faces of said end portions, one of said faces having integrally molded formations cooperating with parts of said plate to prevent relative rotation of said plate and the corresponding end portion, said plate having a compressible portion protruding above said one face, and the other of said faces having integrally molded formations cooperating with said compressible portion resiliently to restrain the sections against relative rotation.

5. A folding ruler comprising elongated substantially flat ruler sections formed of molded plastic material and having portions of their adjacent ends overlapping and pivotally connected together for relative rotation on an axis transverse to the overlapping end portions, and a compressible spring plate between and in contact with the adjacent plastic material faces of said end portions, one of said faces having an integrally molded recess therein, said plate having parts fitting into said recess to prevent relative rotation of said plate and the corresponding end portion, said plate having a compressible portion protruding above said one face, and the other of said faces having integrally molded formations cooperating with said compressible portion resiliently to restrain the sections against relative rotation.

6. A folding ruler comprising elongated sub-

6

stantially flat ruler sections formed of molded plastic material and having portions of their adjacent ends overlapping and pivotally connected together for relative rotation on an axis transverse to the overlapping end portions, and a compressible spring plate between and in contact with the adjacent plastic material faces of said end portions, one of said faces having an integrally molded recess therein, said plate having parts fitting into said recess to prevent relative rotation of said plate and the corresponding end portion, the other of said faces having integrally molded indentations, and said plate having compressible portions protruding above said one face and resiliently engageable in said indentations to restrain the sections against relative rotation.

7. A folding ruler comprising elongated substantially flat ruler sections formed of molded plastic material and having portions of their adjacent ends overlapping and pivotally connected together for relative rotation on an axis transverse to the overlapping end portions, and a compressible spring plate between and in contact with the adjacent plastic material faces of said end portions, one of said faces having an integrally molded elongated recess therein, said plate being elongated and having opposite side portions fitting into said recess so as to prevent relative rotation of the plate and the corresponding end portion by engagement with opposite side walls of said recess, said plate having a compressible portion protruding above said one face, and the other of said faces having an integrally molded formation cooperating with said compressible portion resiliently to restrain the sections against relative rotation.

8. A folding ruler comprising elongated substantially flat ruler sections formed of molded plastic material and having portions of their adjacent ends overlapping and pivotally connected together for relative rotation on an axis transverse to the overlapping end portions and a compressible spring plate between and in contact with the adjacent plastic material faces of said end portions, one of said faces having an integrally molded elongated recess therein, said plate being elongated and having opposite side members fitting into said recess so as to prevent relative rotation of the plate and the corresponding end portion by engagement with opposite side walls of said recess, said plate also having opposite side flanges depending therefrom into said recess and resting on the bottom thereof, the flanges having freedom to spread apart on the recess bottom when the plate is compressed, said plate having a compressible portion protruding above said one face, and the other of said faces having integrally molded formations cooperating with said compressible portion resiliently to restrain the sections against relative rotation.

9. A folding ruler comprising elongated substantially flat ruler sections formed of molded plastic material and having portions of their adjacent ends overlapping and pivotally connected together for relative rotation on an axis transverse to the overlapping end portions, and a compressible spring plate between and in contact with the adjacent plastic material faces of said end portions, one of said faces having an integrally molded elongated recess therein, said plate being elongated and having opposite side members fitting into said recess so as to prevent relative rotation of the plate and the corresponding end portion by engagement with opposite side walls of said recess, said plate also

7

having tongues extending laterally from opposite sides and overlying the face of said recessed section to act as a fulcrum on which the plate is movable under compression, said plate having a compressible portion protruding above said one face, and the other of said faces having integrally molded formations cooperating with said compressible portion resiliently to restrain the sections against relative rotation.

10. A folding ruler comprising elongated substantially flat ruler sections formed of molded plastic material and having portions of their adjacent ends overlapping and pivotally connected together for relative rotation on an axis transverse to the overlapping end portions, and a compressible spring plate between and in contact with the adjacent plastic material faces of said end portions, one of said faces having integrally molded formations cooperating with parts of said plate to prevent relative rotation of said plate and the corresponding end portion, said plate having a compressible portion protruding above said one face, the other of said faces having integrally molded formations cooperating with said compressible portion resiliently to restrain the sections against relative rotation, and a pivot boss formed integrally on one of said faces and butting part of the other of said faces to determine the spacing of said sections.

11. A folding ruler comprising elongated substantially flat ruler sections formed of molded plastic material and having portions of their adjacent ends overlapping and pivotally connected together for relative rotation on an axis transverse to the overlapping end portions, and a compressible spring plate between and in contact with the adjacent plastic material faces of said end portions, one of said faces having integrally molded formations cooperating with parts of said plate to prevent relative rotation of said plate and the corresponding end portion, said plate having a compressible portion protruding above said one face, the other of said faces having integrally molded formations cooperating with said compressible portion resiliently to restrain the sections against rela-

8

tive rotation, a pivot boss formed integrally on one of said faces and butting part of the other of said faces to determine the spacing of said sections, and a pivot extending through said boss and the overlapping end portions and engaging the outer faces of said end portions so as to hold them together with said plate under compression and form the axis for their relative rotation.

12. A folding ruler comprising elongated substantially flat ruler sections formed of molded plastic material and having portions of their adjacent ends overlapping and pivotally connected together for relative rotation on an axis transverse to the overlapping end portions, and a compressible spring plate between and in contact with the adjacent plastic material faces of said end portions, one of said faces having an integrally molded elongated recess therein, said plate being elongated and having opposite side portions fitting into said recess so as to prevent relative rotation of the plate and the corresponding end portion by engagement with opposite side walls of said recess, said plate having a compressible portion protruding above said one face, the other of said faces having integrally molded formations cooperating with said compressible portion resiliently to restrain the sections against relative rotation, and a pivot extending through said boss and the overlapping end portions and engaging the outer faces of said end portions so as to hold them together with said plate under compression and form the axis for their relative rotation, said plate having a central opening therein and said boss extending freely through said opening.

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