July 25, 1933. F. SCHROEDER 1,920,021

END EXPANDER FOR STRUCTURAL TOY RODS

Filed Jan. 28, 1933

Fig. 1

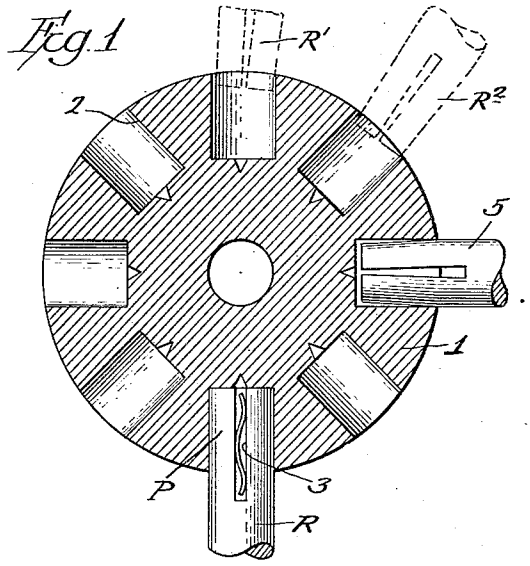


Fig. 3

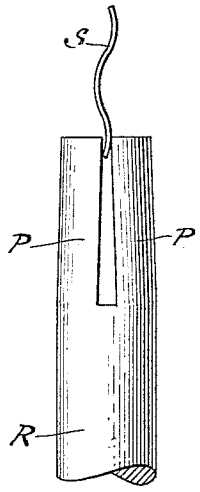


Fig. 4

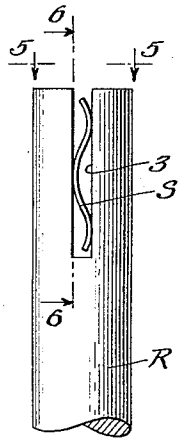


Fig. 8

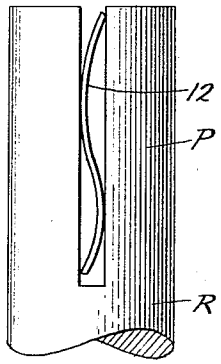


Fig. 7

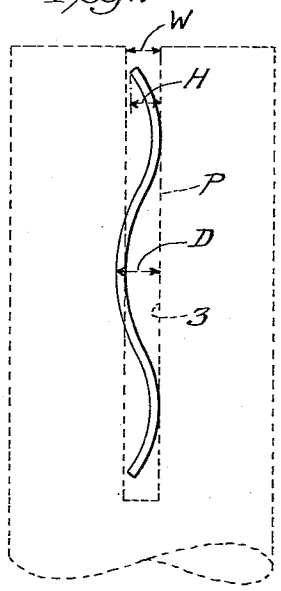


Fig. 2

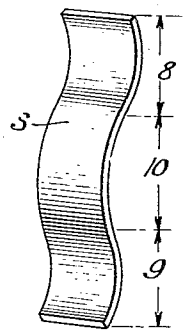


Fig. 6

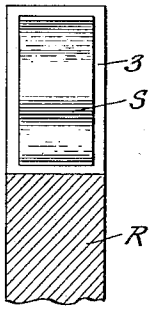


Fig. 9

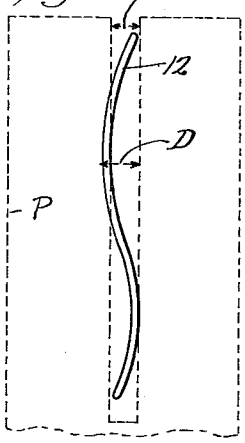


Fig. 10

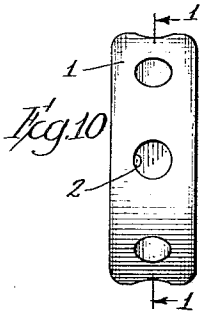


Fig. 11

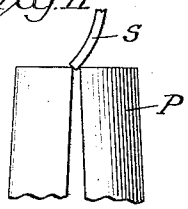
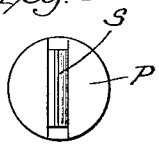


Fig. 5



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by Albert Scheible
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Patented July 25, 1933 1,920,021

UNITED STATES PATENT OFFICE

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END EXPANDER FOR STRUCTURAL TOY RODS

Application filed January 28, 1933. Serial No. 654,021.

My invention relates to the class of toy construction blocks which include wooden rods of uniform diameter and varying lengths, together with connecting members provided with cylindrical bores of uniform diameter in which the ends of such rods can be firmly socketed by a mere slidable insertion of these rod ends into such bores.

To secure an adequately tight socketing of the rods in the connecting members while also facilitating the attaching of the rods to such connecting elements it has long been customary to provide each end of such a rod with a diametric longitudinal slot, usually of greater length than the depth of the bores. This causes each rod end presents two spaced prongs or tines which can flex toward each other to facilitate their insertion in a bore of a connecting member, and so that the two prongs of each rod end will thereafter be sprung apart by the resiliency of the wood for firm engagement with opposite wall portions, of the bore into which a slotted end of a rod is inserted.

This slotted end construction of the rod also has the important advantage that when the prongs are flexed toward each other at the beginning of the insertion of the rod end in a bore of a connecting member, the rod can extend somewhat at an angle to the axis of the bore, thereby permitting the erection of structures or mechanism-simulations in which pairs of rods extend at acute angles (such as angles of 45 degrees) to each other when socketed in adjacent bores in the same connecting member.

In practice, the strains imposed on such slotted rod ends by an oft repeated to-and-fro flexing of their prongs causes a gradual deterioration of the resiliency of the rod ends, particularly when this flexing has to be carried to the extent required when connecting adjacent rods in acute-angled relation to each other. Consequently, a prolonged use of such toy construction elements, and even a fairly short period with a rough handling of the rods, will leave some of the rod ends with a permanent set in which the two prongs slope toward each other and present a tapering end no longer adapted for being firmly gripped by the bore wall which would tightly fit that rod end before such a reduction in its resiliency.

My present invention aims to provide a simple and inexpensive auxiliary member which can readily be inserted (even by a fairly young child in a longitudinally slotted rod end for affording a prong-separating resiliency fully equal to the natural resiliency of the wood in new rods, thereby permitting a continued and effective use of such rods. Illustrative of my solution of this problem,

Fig. 1 is an enlarged section (at right angles to its axis) through a connecting disk provided with radial bores for receiving rod ends, with full lines also showing both a portion of a horizontal end which has lost its resiliency, and a portion of a vertical rod having its end prongs spread apart by an interposed spreader spring embodying my invention.

Fig. 2 is a still more enlarged perspective view of this prong-spreading spring before its insertion into the slot of a rod end.

Fig. 3 is an elevation of a portion of a rod in which the prongs have lost their resiliency, showing the spreader spring during the initial period of its insertion.

Fig. 4 is an elevation similar to Fig. 3, showing the end prongs of the rod as spread apart when the spring has been completely inserted.

Fig. 5 is a plan view taken from the line 5—5 of Fig. 4, and Fig. 6 a section taken along the line 6—6 of Fig. 4.

Fig. 7 is an enlarged side elevation of the same spreader spring as initially formed, with dotted lines showing a side elevation of a split rod end of the corresponding size when this rod end still has its natural resiliency.

Fig. 8 is a view similar to Fig. 4, showing an alternative shaping of my resilient prong-spreader.

Fig. 9 is an enlarged side elevation of the prong-spreading spring of Fig. 8 as initially formed, with dotted lines showing the rod end for which this spring is suitable.

Fig. 10 is a side elevation of the connect-

ing disk of Fig. 1, drawn on a smaller scale.

Fig. 11 is a greatly enlarged view showing a spreader about to be inserted between closely approaching prongs of a rod end.

In the drawing, Figs. 1 and 10 show a conventional connecting disk 1 having eight cylindrical bores 2 of equal diameter and depth extending into it, and also shows portions of wooden rods designed for connection by such a disk. Each of these rods has a diametric slot 3 extending into its end portion for a somewhat greater length than the uniform depth of the said bores, this being a saw slot presenting parallel walls. With the rod ends of the same diameter as the bores 2, this rod can easily be slid axially into any one of the bores for part or all of the length of the bore, after which the resiliency of the wood cooperates with the frictional engaging of the two rod-end prongs by the wall of the bore to hold the rod firmly anchored to the disk.

With new rods, or rods which have not had their slotted end portions subjected many times to end-compressing strains, the resiliency of the wood is ample for holding the two end prongs P against opposite sides of the wall of the bore 2 in which the rod end is inserted. And if the attaching and detaching of the rods was always effected by a purely axial movement of the rod with respect to the corresponding bore, such rods when made of the commonly available dowel stock will retain their resiliency for many years.

However, if two rods R^1 and R^2 have previously been connected by other elements of the structural toy set so that they converge at an angle of 45 degrees toward each other, the prongs of the adjacent free ends of these rods must be flexed toward each other (as shown in dotted lines in Fig. 1) to permit these rod ends to be slid into the corresponding bores. This compressing of the slotted rod ends, which also must be repeated when disassembling the connecting disk from the rods, imposes a considerable strain on the rod end portions and in time practically annuls the resiliency so that the detached rod has its prongs converging toward the tip of the rod as shown for the rod 5 in Fig. 1, or even to the increased extent of having the two prongs bear against each other at their tips.

Consequently, the weakened rod 5 presents a non-resilient end tapering toward its tip, and when this rod is inserted into a bore (as shown for the rod 5 in Fig. 1), the rod end contacts with the wall of the bore only along a circular line, so that the rod can rock about the axis of the bore and also can easily slip out of the bore. To make a rod with such resilientless slotted ends still usable, I provide prong spreaders, each formed of a resilient metal strip considerably thinner than the width W of the rod-end slot 3 in the rod (as initially manufactured), of less width than the diameter of the rod, and bent flatwise to present a sinuous edge.

In the preferred type shown in Figs. 2 to 7 inclusive, the resilient prong spreader S is formed from a steel strip, desirably of a thickness not exceeding about one-fourth the width W of the rod-end slot 3. This strip is curved flatwise so as to present two end portions 8 and 9 convexed in the same direction and connected by a medial portion 10 which is convexed in the opposite direction, as shown in Fig. 2.

Moreover, this curving is such that the maximum distance D to which the central portion arches away from a plane P (Fig. 7) tangential to the outward faces of the two end portions 8 and 9 is materially greater than said rod-end slot width W, while the maximum spacing H of each strip end from the same plane P preferably is less than the said slot width. In practice, I desirably start with a strip of untempered spring steel, shear this to the desired lengths, and then form and anneal the cut strip portions.

With the strip ends at right angles to the faces of the strip before the latter is curved, these ends will be at an angle to the general plane of the strip, so as to present wedge-like ends (as shown in Fig. 11) which will readily spread the prongs of a collapsed rod end apart when the spread is pushed against that rod end.

During the insertion of the spreader in this manner, the medial portion 10 of the spreader is reduced in the extent of its bowing because of the previously recited difference between the distances D and W in Fig. 7; but both tips of the spreader may still be freely spaced from the slot wall (as shown in Figs. 4 and 7) along which the medial bowed portion 10 slides, so that these tips will not scrape on the last named slot wall to interfere with the easy inserting of such a spreader even by a young child.

When once pushed into a rod-end slot in this manner, the resiliency of my spreader causes it to spread the prongs back to their normal spacing, as shown in Fig. 4. The inserted spreader then exerts sufficient pressure against the opposed walls of the slot to prevent having the spreader shaken out, and also yields sufficiently to permit the prongs to be approached to each other when the rod end needs to be slid into a connector bore with the axis of the rod somewhat at an angle to that of the bore. In other words, my simple and cheap spreader effectively restores the initial resiliency to the slotted rod end.

In practice, the width of such a resilient spreader can be varied considerably, but I desirably make it approximately three-fourths as wide as the diameter of the rod

with which it is to be employed, thereby enabling me to obtain the needed resilient thust with a spreader made of a strip which is so thin as to permit the spreader-equipped rod end to have its prong tips flexed almost into touching relation to each other when necessary.

Since the entire cost of such a prong-spreader is exceedingly small, and since only part of the rods of a structural toy set of this class may lose their resiliency in ordinary use, the including of a supply of such resiliency-restoring prong spreaders adds only trivially to the cost of the set, although greatly increasing the period of time during which the elements of the set will give continuous satisfaction to its users.

However, while I have heretofore described my prong spreader as having three successive portions curved in alternately opposite directions, I do not wish to be limited as to this or other here disclosed details, since changes might be made without departing either from the spirit of my invention or from the appended claims. For example, Figs. 8 and 9 show a spreader 12 of a simple S-shaped edge view.

I claim as my invention:

1. In a toy construction set including a rod which has its end portion divided into two prongs by a diametric slot, means to resiliently hold said prongs apart comprising a spring slidably insertible into the slot and made from flat resilient metal of a thickness less than half the distance between the opposed walls of the slot; the spring being formed to a sinuous side elevation to present convexed face portions alternately to the said opposed walls.

2. In a toy construction set including a rod which has its end portion divided into two prongs by a diametric slot, means to resiliently hold said prongs apart comprising a spring slidably insertible into the slot and made from flat resilient metal of a thickness less than half the distance between the opposed walls of the slot; the spring being formed to a sinous side elevation to present convexed face portions alternately to the said opposed walls; and the spring before its insertion having a spread transversely of the general plane of the spring, greater than the width of the said slot.

3. In a toy construction set including a rod which has its end portion divided into two prongs by a diametric slot, means to resiliently hold said prongs apart comprising a spring slidably insertible into the slot and made from flat resilient metal of a thickness less than half the distance between the opposed walls of the slot; the spring being formed to a sinuous side elevation to present two face portions bowed away from the general medial plane of the spring and an interposed face portion bowed in the opposite direction.

4. In a toy construction set including a rod which has its end portion divided into two prongs by a diametric slot, means to resiliently hold said prongs apart comprising a spring slidably insertible into the slot and made from flat resilient metal of a thickness less than half the distance between the opposed walls of the slot; the spring being formed to a sinuous side elevation to present two face portions bowed away from the general medial plane of the spring and an interposed face portion bowed in the opposite direction, the maximum spacing of the said interposed face portion from a common plane tangential to the first named face portions being greater than the width of the said slot.

5. In a toy construction set including a rod which has its end portion divided into two prongs by a diametric slot, means to resiliently hold said prongs apart comprising a spring as per claim 4, in which each tip of the spring is spaced from the said plane by a distance less than the said maximum spacing.

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