

[54] **JOINT FOR COLLAPSIBLE LADDERS**

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[51] **Int. Cl.**..... **E05d 11/10**

[58] **Field of Search** ..... 16/144, 145, 146, 141;  
403/92, 93, 101, 102, 100; 182/163, 164

[56] **References Cited**

**UNITED STATES PATENTS**

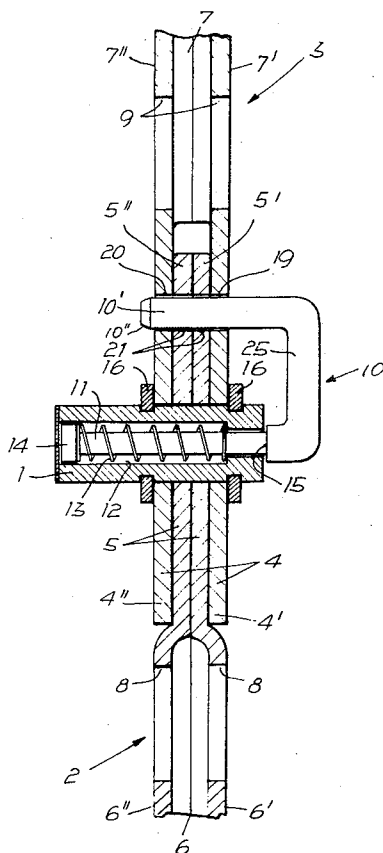
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|-----------|---------|----------------------|---------|
| 261,894   | 8/1882  | Albers.....          | 403/93  |
| 2,805,016 | 9/1957  | Brooking et al. .... | 403/102 |
| 3,517,772 | 6/1970  | Weis et al. ....     | 182/163 |
| 2,024,039 | 12/1935 | Harting .....        | 16/144  |

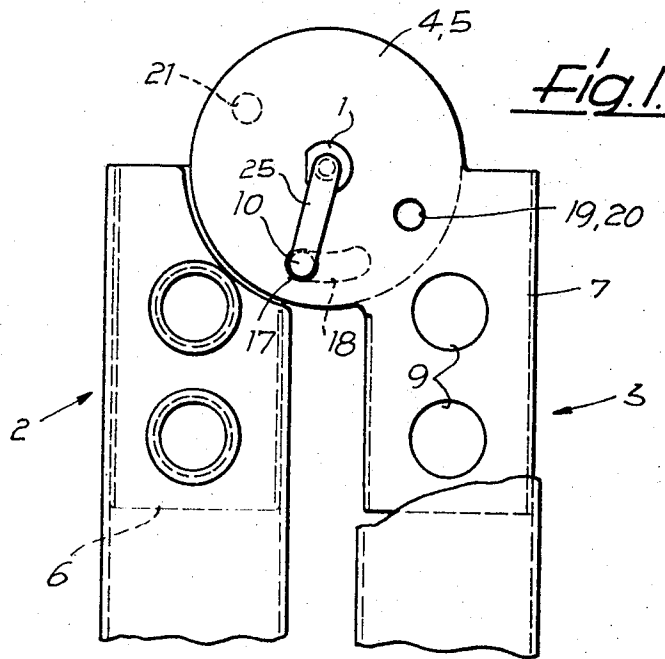
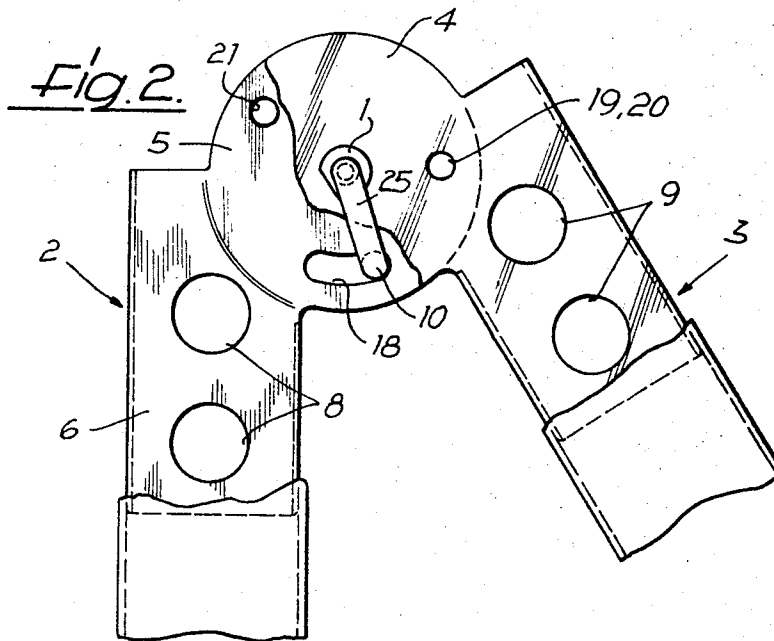
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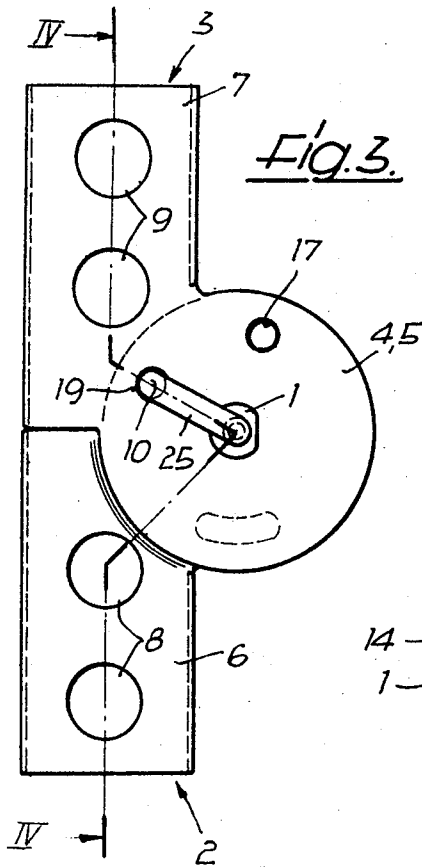
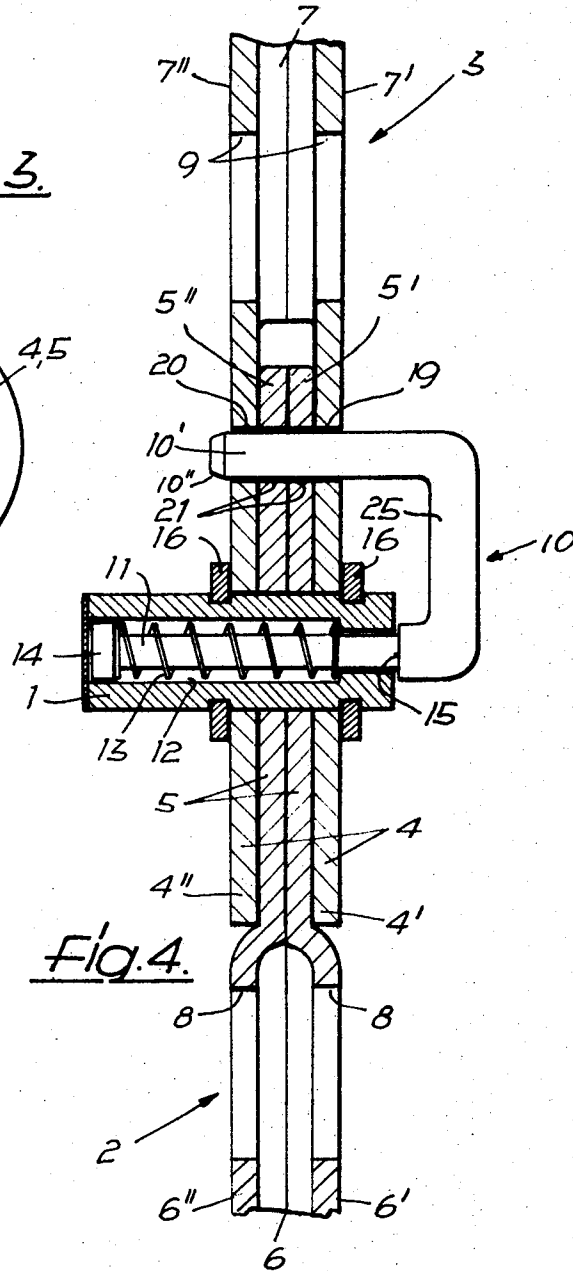
[57] **ABSTRACT**

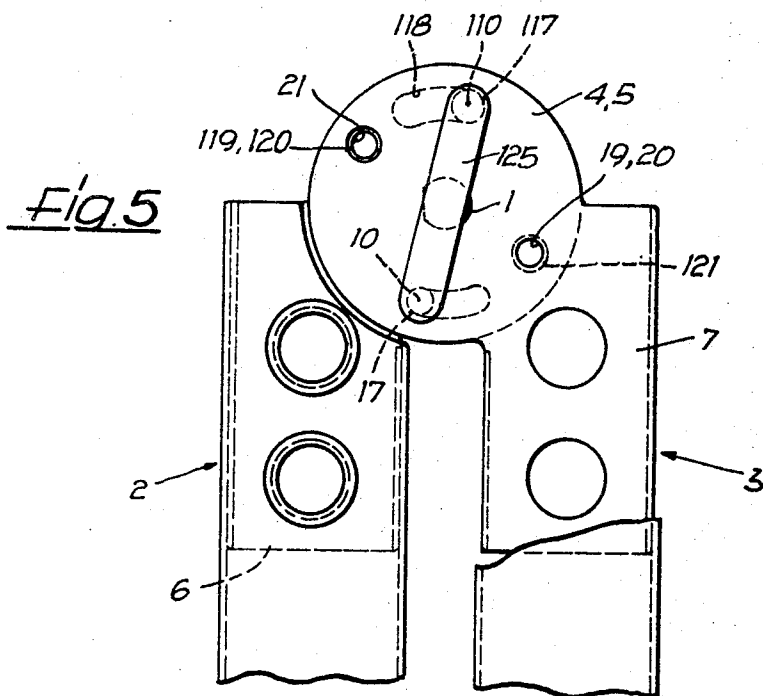
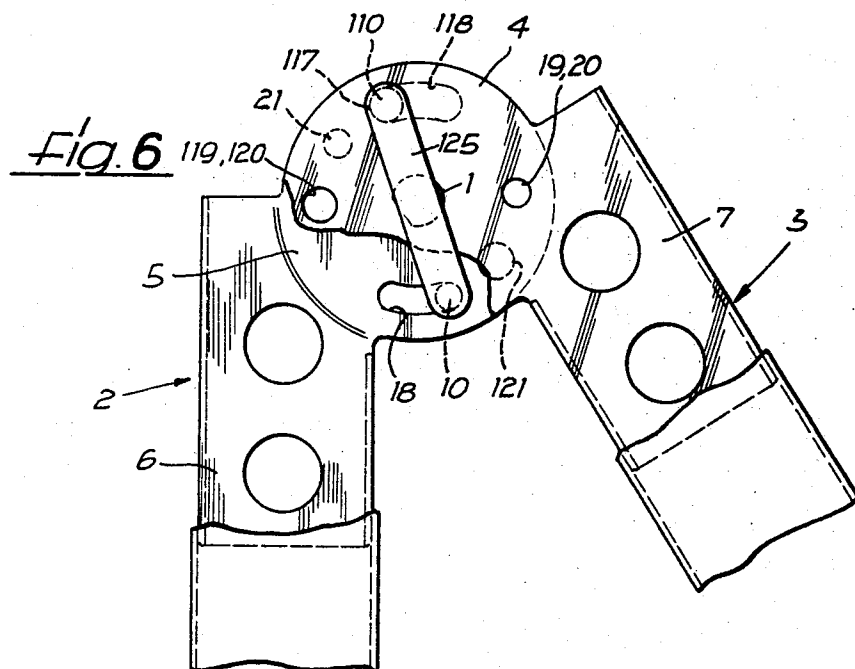
A joint for collapsible ladders, wherein two members are pivotally connected to each by means of a hinge pin. Each member has a flange portion, through which the hinge pin extends, and a shaft portion adapted to be connected to the ladder stringer. A locking member comprising at least two parts adapted to be moved from a first locking position onto a second locking position and viceversa for locking the two members in at least two predetermined angular positions relating to each other. Biasing means connected to the two part of the locking member, which may be telescopically extended, for urging the locking member into one of the locking positions. The locking member being guidingly mounted on the hinge pin and includes a projecting portion which extends through an opening in the flange portion of each member when the locking member is in a locking position. Each flange portion having at least two openings each one of which is adapted to be aligned with a mating opening of the other flange portion when the ladder stringers are in a predetermined angular position to receive the projecting portion of the locking member and thereby lock the two ladder stringers in a predetermined angular position relative to each other.

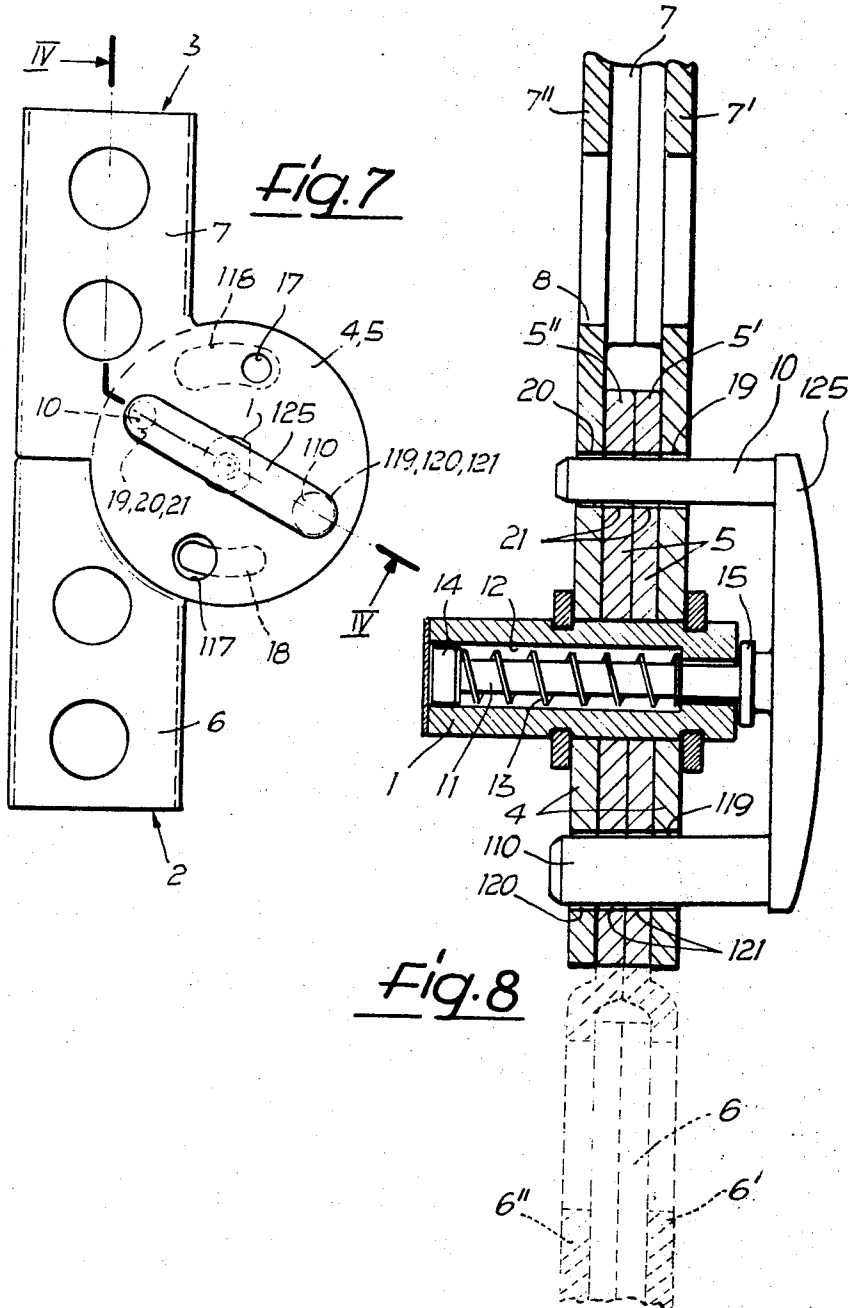
**13 Claims, 12 Drawing Figures**

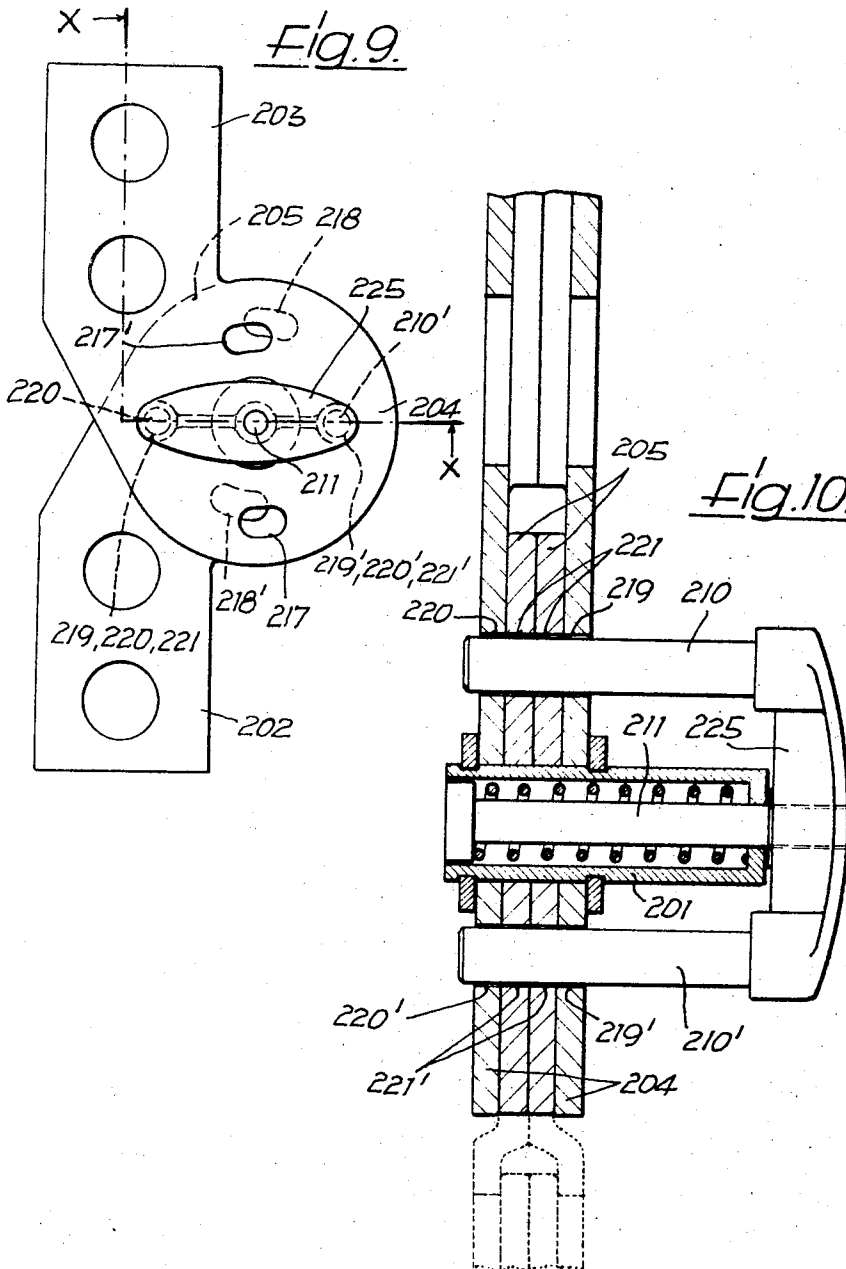












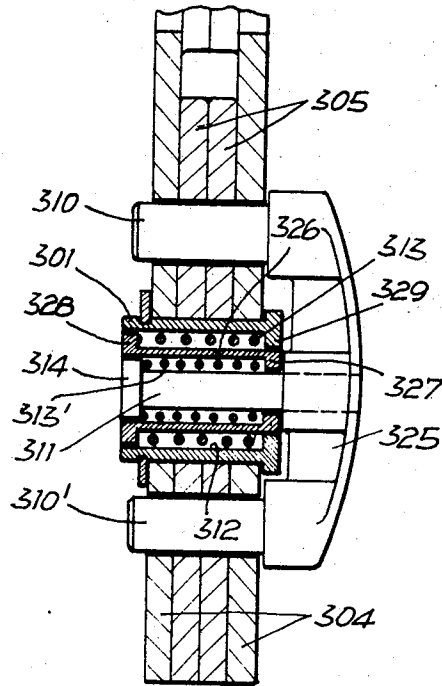


Fig. 11.

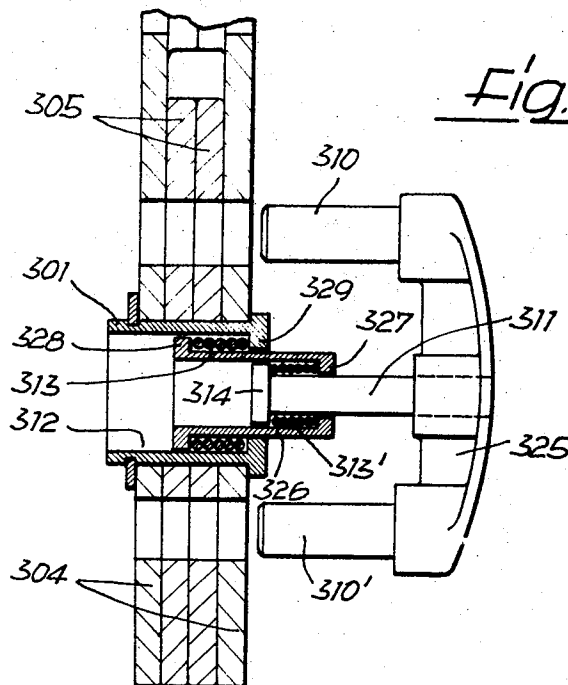


Fig. 12.

## JOINT FOR COLLAPSIBLE LADDERS

## BACKGROUND OF THE INVENTION

The invention concerns a joint for collapsible ladders wherein two members of the joint are pivotally connected to each other by means of a hinge pin. The two members are each provided with a flange portion and a shaft portion. The pivotal connection is mounted on the flange portion of the two members. The joint forming part of this invention also includes a locking member which is urged by a suitable spring means from a non-locking position into a locking position. The locking member can be manually moved from its locking position against the force of the spring into a non-locking position and can be returned into a locking position after the ladder stringers have been angularly moved towards each other from one predetermined angular position into a second predetermined angular position. When such a movement has been completed suitable mating openings in the flange portions are aligned with each other and a projecting portion of the locking member extends through these mating openings to lock the two members into the predetermined angular position.

The collapsible ladder joints of the prior art have open grooves located in the outer periphery of the flange member and the locking member is formed as a slidable bolt which moves in a radial direction against the outer periphery of the flange portion when being moved into a locking position. Since the open grooves are exposed, either completely or partially, debris might accidentally enter into it such as plaster, chips of brick and the like. If this occurs the locking bolt may enter into the groove only partially thereby form an insecure joint. This is particularly dangerous because the sliding bolt is covered in one of the shaft portions of the ladder joint and therefore the fact that the ladder joint is not securely bolted can easily be overlooked. Thus the ladder joint must be strictly examined and controlled to ascertain whether the sliding bolt has penetrated sufficiently deep into the groove or if the groove has to be cleaned. A further drawback of the aforementioned known type of collapsible ladder joint resides in that dirt, cement, plaster, colors and the like may penetrate into the shaft portion, which can lead to a partial blocking of the sliding bolt and thereby could damage its correct operation in particular its return movement by its return spring. This can also lead to an insufficient locking of the two members forming the ladder joint, and also the danger of a failure to recognize such an insecure locking operation by the person using the ladder.

## SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide a joint for collapsible ladders which is of a simpler construction as the aforementioned joint construction of the prior art while at the same time eliminating the danger of carrying out an insufficient locking operation or to at least indicate that such insufficient locking has occurred. This object is effected in accordance with the invention by providing a locking member which includes a projecting rod portion which is slidably movably mounted relative to the hinge pin of the joint and which extends in an axial direction,

when the locking member is in its locking position, through both flange portions of the joints.

Such a rod portion will push out any dirt, cement or the like which may have accumulated in the opening due to the fact that the rod portion is axially guided as it moves through openings in the flange portions. In the event the return spring has not sufficient force to push the accumulated dirt out of the corresponding opening, the position of the rod indicates clearly that the joint is insufficiently locked. A blow by hand on the rod portion then practically always suffices to place this rod portion into the correct locking position. This represents another significant advantage when compared to the joint construction of the prior art because, in addition to clearly indicating the incorrect or correct locking of the joint, the prior art constructions require normally a special tool for cleaning the joint so that the locking bolt may again penetrate into the complete locking position, whereas in applicant's joint construction no such special tool is necessary.

A further advantage resides in that the locking arrangement requires no shaft portions, so that it can be connected with aluminum stringers without difficulty, whereas normally connecting elements with relatively large diameters are required. In the shaft portion of the prior art which includes the locking bolt there is no space for such connecting elements.

In a preferred embodiment of the invention the joint is provided with a central longitudinal bore or bush in which a guide rod which is connected to the rod portion is guidingly, axially, movably mounted. This arrangement provides a substantial protection against soiling of the guiding arrangement. In such general arrangement of guiding the guide rod and the locking member or locking members, the arrangement can be provided with a cross beam for manually moving the locking member. It has been found to be of particular advantage to mount the return spring in the longitudinal bore which is defined by the hinge pin preferably in the annular space between the guide rod and the walls of the bore. In this manner considerable space saving is effected and the return spring is practically completely protected against any accumulation of dirt.

A particular advantage of the joint for collapsible ladders in accordance with this invention resides in the space saving that can be effected with the construction. The dimension in the axial direction can be kept at a minimum in that at least one bushing with limited slidability in the longitudinal direction is mounted on the guide rod as well as in the longitudinal channel of the hinge pin in that in addition to the first return spring there are mounted additional springs corresponding in number to the number of bushings. One of the return springs bears at one of its end against the guide rod and with its other end against the bushing and the other return spring bears with one of its end against the bushing and with its other end against the hinge pin in an axial direction. In this constructional arrangement the length of the guide rod and its guiding means can be limited to the axial length of the hinge pin even when, for reasons of constructional reliability, the locking member or the locking members have an axial length which makes it possible that in the locking position both flange portions are completely traversed.

A further advantageous feature of the joint for collapsible ladders in accordance with this invention, re-

sides in that a plurality (preferably two) locking members are diametrically arranged relative to hinge pin and can be manually adjusted by means of a yoke or cross beam which joins the locking members to each other. For example if two locking members, diametrically arranged relative to the hinge pin, are used the distance of their locking rod portions relative to the hinge pin need only be about one half the distance if one locking rod portion is used in order to provide the same load resistance of the joint in its locked position. Thereby the overall dimensions of the flange portion can also be significantly smaller as compared to the size of the flange portion of a joint having one single locking member.

A further particular advantage of the construction of the invention resides in that it permits, when an actual angular movement of the ladder stringers relative to each other is effected, to preselect the new angular position so that when it is reached the joint is automatically locked. This advantageous feature can be incorporated in the embodiments of the invention having only one single locking member as well as in the embodiments having a plurality of locking members. The feature requires that there are openings in both flange portions which align when a predetermined angular position is reached. It is possible in such an arrangement to position the locking rod portion or portions into one opening or openings of one flange portion before the ladder stringers are moved into the new angular position without thereby locking the joint. The locking is effected automatically by means of the force of the return spring only when the new angular position is reached, because only then when this position is reached are the openings of the two flange portions aligned with each other and permit the passage of the locking rod portion or portions.

Such a preselection of the new angular position and the automatic locking in the new angular position is even possible when at least two locking rod portions are used, as long as the openings in the flange portions are arranged in such a way that the passage of the locking rod portion is only possible when the correct angular position of the ladder stringers is reached. In a particular simple constructional arrangement the locking rod portions have different cross sectional areas and the mating openings in the flange portions have corresponding cross sectional areas thereby assuring passage of the locking rod portions only when the correct angular position is assumed. In this simplified arrangement the distances of the locking rod portion from the hinge pin can be different while the locking rod portion cross sections and corresponding openings can be identical. In this way the same result is achieved.

#### BRIEF DESCRIPTION OF THE DRAWING

The invention is illustrated by way of example in the accompanying drawing which forms part of the application and in which various embodiments of joints for collapsible ladders which embody the invention are shown.

FIG. 1 is a partial side elevational view of a first embodiment in which the ladder stringers and the joint are in an angular position relative to each other adapted for transporting the ladder;

FIG. 2 is a partial elevational side view of the joint illustrated in FIG. 1 wherein the ladder stringers are in

an angular position relative to each other which corresponds to a working position of the ladder;

FIG. 3 is a partial side elevational view of the first embodiment of the joint wherein the ladder stringers are in an angular position relative to each other which corresponds to the second working position of the ladder;

FIG. 4 is a cross sectional view along line IV—IV in FIG. 3 at a larger scale than FIG. 3;

FIG. 5 is a partial side elevational view of a second embodiment of a joint for collapsible ladders, in accordance with the invention, wherein the ladder stringers are in a non-working position that is adapted for transportation;

FIG. 6 is a partial side elevational view of the joint illustrated in FIG. 5 wherein the ladder stringers are in an angular position corresponding to a first working position of the ladder;

FIG. 7 is a partial elevational side view wherein the ladder stringers are shown in a second angular position relative to each other corresponding to a second working position of the ladder;

FIG. 8 is a cross sectional view along line IV—IV in FIG. 7 wherein the parts are shown in a larger scale;

FIG. 9 is a partial elevational side view of a third embodiment of a joint in accordance with the invention, wherein the members of the joint are shown in an angular position corresponding to a second working position of the ladder stringers in which the ladder is fully extended;

FIG. 10 is a cross sectional view along line X—X of FIG. 9 wherein the parts are shown in a larger scale;

FIG. 11 is a cross sectional view similar to FIG. 10 illustrating a fourth embodiment of the joint for collapsible ladders forming part of this invention wherein the joint is shown in a locked position; and

FIG. 12 is a cross sectional view corresponding to FIG. 11 of the fourth embodiment of the invention wherein the joint is shown in an unlocked position.

#### DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawing and in particular to the embodiment illustrated in FIGS. 1—4, there is shown a joint for collapsible ladders with which the ladder may be used as a step ladder as well as an extension ladder. The joint includes two members 2 and 3 which are pivotally connected to each other by means of a hinge pin 1. The members 2 and 3 may consist of aluminum sheet metal but can also be made of any other suitable material. Each member 2 and 3 includes a flange portion 4, 5 and a shaft portion 6, 7, the latter being adapted to be joined to the ladder stringers.

The two shaft portions 6 and 7 are preferably in the illustrated embodiment formed in the shape of a square tube which for facilitating the mass manufacture is formed of two U-portion 6' respective 6'' and 7' respectively 7''. If the ladder stringers are also formed by square shaped aluminum tubes, it is advantageous, to provide the two shaft portions 6 and 7 with two bores 8 and 9 of relatively large diameters. The aluminum tubing which forms the stringers can then be joined by means of hollow rivets which extend through the shaft portions, the diameter of which corresponds to the diameter of the bores 8 and 9, thereby forming a strong connection and eliminating for all practical purposes the danger of failure of the joint.

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As can be noted from FIG. 4, the total width in the longitudinal direction of the shaft portions 6 and 7 is equal double the width of the sheet metal which has been selected for making the members 2 and 3. Thereby there is formed a space between the substantially round flange parts 4' and 4'', which form the flange portion 4, which is equal to double the wall thickness of the sheet metal of which the members 2 and 3 are made. Again referring to FIG. 4 it can be noted that the shaft portion 7 is made of the U-shaped portions 7' respectively 7'' which form a unit and which have the bores 9. Because of the unitary construction of the flange portions, formed by both a U-shaped portions 7' and 7'', it is necessary that in the corner zone of the shaft portion 7, a shank portion is omitted which corresponds in length to the circular segment of the round-shaped flange portion 4 along which the ladder is joined to the shaft portion 7.

There are mounted two adjoining flange parts 5' and 5'' between both flange parts 4' and 4'', which form jointly which the shaft portion 6, consisting of two U-shaped parts 6', 6'', a unitary construction. The diameter of the flange parts 5' and 5'' is equal to the diameter of the flange parts 4' and 4''. Furthermore the position of the flange parts 5', 5'' relative to the shaft part 6 corresponds to the position of the flange parts 4', 4'' relative to the shaft part 7. As can be noted from FIG. 1-3 the center of the flange portions 4 and 5 lies outside of the shaft portions 6 and 7. This construction makes it possible to move the members 2 and 3 from a position in which they are parallel to each other (FIG. 1) to a position in which they are aligned with each other and their front faces contact each other (FIG. 3).

A locking between the members 2 and 3 is carried out by means of a locking arrangement, which includes a locking rod 10, having a locking rod portion and a guide rod 11 which is axially slidably guided in the central bore 12 of a hinge pin 1. The bore 12 has an enlarged portion for accommodating three compressed coil springs 13 which bears with one of its end against the shoulder defining a narrow portion of the bore 12 and at the other end against an enlarged collar 14 of the guide rod 11. The length of the hinge pin 1 is selected in such a way that the collar 14 is in all positions of the locking rod portion 10 situated in the bore 12. By correctly dimensioning the bore of the hinge pin so that little clearance is provided between the guide rod 11 and the narrow portion of the bore 12 as well as between the collar 14 and the enlarged portion of the bore 12, an accumulation of dirt and debris within the bore 12 is practically eliminated and thus the correct functioning of the coil spring 13 is assured.

A shoulder 15 of the guide rod 11 prevents the return spring 13 from moving the guide rod 10 beyond a predetermined locking position in which the yoke or cross beam 25 is still located at a sufficient position from the flange part 4' to permit the manual grasping of the yoke or cross beam 25. It is thus possible by a simple manipulation of the yoke 25 to adjust the locking rod 10.

The hinge pin 1 of the first embodiment is secured against axial displacement by means of two oppositely spaced rings 16 which are mounted in mating grooves in the hinge pin 1. Furthermore the hinge pin 1 is provided with a lateral flat cut portion which bears against a mating flat surface in the flange parts 4 and 5, thus securing the hinge pin 1 against rotation. The hinge pin 1 has just enough axial length to accommodate the

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guide rod 11 and to securely guide it as well as to accommodate the coil springs 13. Thus due to the combination wherein the hinge pin extends axially bilaterally beyond the width defined by the flange portions 4 a space saving arrangement is provided.

At a distance corresponding to the distance between the longitudinal axis of the locking rod portion 10' from the axis of the joint, there are provided in each flange part 4', 4'' a bore 17, which are aligned relative to each other. In order to facilitate the sliding in and sliding out of the locking rod portion 10' the diameter of the bores 17 is slightly larger than the diameter of the locking rod portion 10'. The flange part 5 is provided with a longitudinal slot 18 extending in a circumferential direction, the width of which corresponds to the diameter of the bores 17 and one end of which overlaps completely with the bores 17 when the shaft portion 6 and 7 assume an acute angle as illustrated in FIG. 2, said acute angle corresponding to the angle which the ladder stringer assume when they are in a normal working position, that is in a position where the ladder forms a step ladder. The other end of the longitudinal circumferential slot 18 overlaps with the bore 17 when both shaft portions 6 and 7 are situated parallel to each other. This position corresponds to the position wherein the ladder is ready to be transported. By providing a longitudinal circumferential slot 18 in lieu of two individual bores it is possible to move the ladder without actuating the locking arrangement from the angular position illustrated in FIG. 1 to the angular position illustrated in FIG. 2 and vice versa.

There are provided in the flange parts 4' and 4'' at a distance from the bores 17 overlapping bores 19 respectively 20, which are aligned towards a bore 21 in the flange portion 5 when both shaft portions 6 and 7 are in the position illustrated in FIG. 3. The locking rod 10 can, in this position, pass through the bores 19, 20 and 21, and thereby lock the joint in position. In view of the fact that there are provided special bores for locking the joint in the position illustrated in FIG. 3, it is possible, when the members 2 and 3 ought to be moved relative to each other from the position illustrated in FIG. 2 to the position illustrated in FIG. 3, to preset the locking rod 10 into the bore 19. The locking rod portion 10 then passes automatically into the bore 21 and the bore 20, as soon as the position illustrated in FIG. 3 is reached by the members 2 and 3. Similarly, before the moving of the ladder from the position in FIG. 3 to the position illustrated in FIG. 2 the locking rod 10 is first placed into one of the bores 17. Both hands are then available for fringing the ladder stringers into the desired position. Despite this release of the locking rod 10 the arrangement nevertheless secures a locking operation when the ladder stringers have reached the desired position. By narrowing the free end 10'' of the locking rod portion 10' the introduction of the locking rod 10 into the various bores is facilitated.

FIGS. 5-8 illustrate a second embodiment of the joint of the invention. Since the variation from the first embodiment resides primarily in the provision of a second locking rod portion, the reference numerals have not been changed for those parts and portions of the arrangement which have not changed relative to the embodiment of FIGS. 1 to 4 so that these parts and portions are referred to with the same reference numerals

as in the first embodiment and are not described in detail herein-below.

Diametrically opposite to the locking rod portion 10 and parallel to it as well as parallel to the guide rod 11 there is provided a second locking rod portion 110. The distances between both locking rod portions 10' and 110 relative to the guide rod 11 are equal. The yoke 125 joins the locking rod portions 10' and 110 with the guide rod 11 at one of its ends. The second locking rod portion 110 has a circumferential cross section as has the first locking rod portion 10'. As can be noted clearly from FIG. 8, however, the diameter of the locking rod portion 10' is substantially smaller than the diameter of the locking rod portion 110.

There is provided in both flange parts 4' and 4'' at a distance from the joint axis, corresponding to the distance of the longitudinal axis of the locking rod portion 110 from the joint axis, diametrically opposite to the bores 17 in each flange part a bore 117 which overlap each other completely. The diameter of these bores is slightly larger than the exterior diameter of the locking rod portion 110 so that there exists a play between the latter and the walls of the bores 117 thereby facilitating an easy introduction and removal of the locking rod portion 110. Diametrically opposite from the longitudinal circumferential slot 18 there is provided in the flange portion 5 a longitudinal circumferential slot 118. The width of this circumferential slot in the radial direction is equal to the diameter of the bore 117. One end of the longitudinal slot 118 overlaps completely with the bore 117, when both of the shaft portions 6 and 7 assume the angular position illustrated in FIG. 6. The other end of the longitudinal circumferential slot 118 overlaps with the bore 117, and both of the shaft parts 6 and 7 extend parallel and next to each other.

To the same extent and direction in which the bores 19 and 20 are offset in the circumferential direction relative to the bores 17, the bores 119 and 120 are offset relative to the bore 117. When the shaft portions 6 and 7 assume the position illustrated in FIGS. 7 both of the bores 119 and 120 are overlapped with a bore 121 in the flange portion 5, that is they have their wall surfaces aligned with each other. In such a position the locking rod portion 10' then passes through the bores 19, 20 and 21 whereas the locking rod portion 110 can pass through the bores 119, 120 and 121 thereby locking the joint. Since there are provided special bores and the diameters of the locking rod portion 10' and 110 as well as the diameters of the appurtenant bores and longitudinal circumferential slots are different, it is possible, for locking the joint in the position illustrated in FIG. 7, when swinging both shaft parts from the position illustrated in FIG. 2 to the position illustrated in FIG. 3, to place the locking rod portion 10' into the bore 119 prior to carrying out the aforementioned swinging movement. The locking rod portions remain during this swinging process in their position, since the diameter of the bore 21 which is smaller when compared to the diameter of the locking rod portion 110 prevents a sliding of the locking rod into the locking position even when the locking rod portion 110 is aligned with the bore 21. Only when the position illustrated in FIG. 3 is reached can the locking rod portions 10' and 110 automatically penetrate the bores 20 and 21, respectively 120 and 121. Similarly, the locking rod portions 10' and 110 can first of all be respectively inserted in to the bore 17 respectively 117 before

swinging the ladder from the position illustrated in FIG. 7 into the position illustrated in FIG. 6. Thus the person servicing the ladder has at all times both hands free for manipulating the ladder before carrying out the swinging operation. Thereafter an automatic locking of the ladder is secured as soon as the desired angular position has been reached.

In lieu of providing locking rod portions with different cross-sectional areas it is also possible to provide locking rod portions with equal cross-sectional areas if the locking rod portions are differently radially spaced from the axis. This variation of the invention is illustrated in a third embodiment (6, 9 and 10). In these figures there is illustrated a yoke 225 which joins the guide rod 211 with the locking rod portions 210, 210' having equal diameters. However, the distance of the locking rod portion 110 from the guide rod 211 is smaller as the corresponding distance of the locking rod portion 210.

As is shown in FIG. 9, these different distances are required so that the corresponding locking rod portions between the bores and longitudinal circumferential slots in both flange portions 203 and 205 are correspondingly located. Thus they are arranged in suitable locations the bores 217, 219, 220 and 221 as well as the longitudinal circumferential slot 18 for coaction with the locking rod portion 210 and the bores 217', 219', 220', 221' as well as longitudinal circumferential slot 218' which coact with the locking rod portion 210'. The relative positions of these bores and longitudinal circumferential slots is identical to the bores and slots described in relation to the locking rod portion 10' respectively 110 described in connection with the embodiment of FIGS. 7 and 8. Therefore also in this embodiment the locking rod portions 210 and 210' can with their free ends be placed into the bores in the flange portion 204 by manually handling the yoke 225 before the axial swinging movement of the members is effected, whereby an automatic locking of the joint in the newly selected regular position is effected. Here again therefor the person using the ladder has both hands free for carrying out the swinging movement.

In any other respect the embodiment is in principle constructed identically to embodiments described hereinabove. Although the two members 202 and 203 are somewhat differently shaped in FIGS. 9 and 10 this in no way affects the basic inventive concept of the locking arrangement and is therefore not described in detail, in particular since the members forming the joint as well as the hinge pin 201 and the guide rod 211 can be constructed identically to the construction of the preceedingly described embodiments.

Independent of the feature of using only single locking rod portions or a plurality of locking rod portions with different cross-sectional areas or differently distanced from the joint axis; there can still be obtained a substantial reduction in the overall dimension of the joint in the axial direction by providing a telescopic-like arrangement for the guide rod or hinge pin. Such a variation is illustrated in the embodiment of FIGS. 11 and 12. In this embodiment there are also provided two identical locking bolts 310 and 310'. The length of these locking bolts are, as compared to the embodiment of FIG. 10, substantially shorter which is due to the telescopic arrangement between the hinge pin and the guide rod.

Both of the flange portions 304 and 305 are pivotally connected to each other by means of a hinge pin 301. This hinge pin is constructed in the form of a bushing and has on the side which faces the two locking rod portions 310 and 310', which are joined by a yoke 235, a collar portion 329 which extends into the central bore 312. The radial height of this collar portion 329 is somewhat larger than the wire thickness of the coils of a first return spring 313, said return spring 313 being mounted within the bore 312 and has an interior diameter, which is somewhat larger than the interior diameter of the collar portion 329.

A bushing 326 is mounted in the bore 312 and has an axial length that is equal to the axial length of the hinge pin 301. The exterior diameter of the bushing 326 is so dimensioned that it can easily but without large play be slidably moved into the axial direction within the hinge pin. The end of the bushing 326, which is situated within the collar portion 329, when the latter is completely pushed inside of the hinge pin, has in turn an interiorly projecting collar portion 327, whereas the opposite end is provided with an exteriorly projecting collar portion 328. The radial height of the collar portion 328 is approximately equal to the radial height of the collar portion 329 due to this arrangement the bushing 326 is guided when being actually moved by the collar portion 329 as well as by the collar portion 328. Both of these collars also serve for supporting surfaces for the precompressed coil spring 313, which is mounted in the annular space between the bushing 326 and the interior wall surfaces of the hinge pin 301.

The guide rod 311 extends within the bushing 326, the diameter of the guide rod 311 being somewhat smaller than the interior diameter of the collar portion 327 of the bushing 326, so that an axial displacement relative to the bushing 326 can be easily effected without large play. The guide rod 311 has at its free end a radially outward projecting collar portion 314, the radial height of which is equal to that of the collar portion 327. A second, similarly precompressed coil spring 313 is mounted within the annular space between the guide rod 311 and the bushing 326 and abuts, on the one hand against the collar portion 327, and on the other hand, against the collar portion 314.

Both of the coil return springs tend to maintain the bushing 326 as well as the guide rod 311, and thereby also both locking rod portions 310 and 310', in the position illustrated in FIG. 11, which is the locking position. The yoke 325 prevents a further displacement of the bushing and the guide rod towards the right as viewed in FIG. 11. Since both of the return coils springs 313 and 313' can only be compressed to the extent when their individual helical coils abut against each other, the bushing 326 can only be partially pulled out from the hinge pin 301 and the guide rod 311 can only be partially pulled out from the bushing 326. However, both of these axial displacements suffice to move the locking rod portions 310 and 310' out of their locking position in which they are situated in corresponding bores, as is shown in FIG. 12.

The bores and longitudinal circumferential slots for accommodating the locking rod portions are arranged and constructed similarly to the arrangement and construction of the embodiment illustrated in FIGS. 9 and 10. The same applies to the other parts of the joint. Therefor a detailed description of the other features of the joint construction is not necessary.

Although the invention is illustrated and described with reference to a plurality of preferred embodiments thereof, it is to be expressly understood that it is in no way limited to the disclosure of such a plurality of preferred embodiments, but is capable of numerous modifications within the scope of the appended claims.

What is claimed is:

1. A joint for collapsible ladders, comprising in combination;

two members each of which has a flange portion and a shaft portion;

a hinge pin extending at least partially through said flange portion of each member for forming a pivotal connection between said two members;

said shaft portion of each member being adapted to be connected to a ladder stringer of the collapsible ladder;

a locking member comprising at least one locking rod portion and one guide rod portion which are parallel and which are adapted to be moved from a locking position to a non-locking position and vice-versa; said ladder stringers and two members being swingable about said hinge pin relative to each other when said locking member is in a non-locking position;

said guide rod portion being guidingly axially movable in said hinge pin from said locking to said non-locking position and vice-versa;

biasing members operatively connected to said guide rod portion for urging it into said locking position;

said flange portion of each member having at least two openings each of which is adapted to be aligned with a mating opening in the other flange portion and said locking rod portion being adapted to pass through said openings to lock said two members in a predetermined angular position relative to each other.

2. The joint for collapsible ladders as set forth in claim 1, wherein said hinge pin is hollow and has a central bore in which said guide rod portion is axially slidably movable.

3. The joint for collapsible ladders as set forth in claim 2, wherein said locking member includes two locking rod portions which are parallel to said guide rod portion and are connected to it by a manually adjustable yoke member.

4. The joint for collapsible ladders as set forth in claim 3, wherein both of said locking rod portions are equally radially spaced from said hinge pin but have different cross-sectional areas and said openings in said flange portions having corresponding different cross-sectional areas so that an alignment of openings of the same size in said flange portions permits the passage of a mating guide rod portion therethrough.

5. The joint for collapsible ladders as set forth in claim 4, wherein said locking rod portions are round and have different diameters and the openings in the flange portions have a width in the radial direction relative to said hinge pin which substantially corresponds to the diameter of the coaxing locking rod portion.

6. The joint for collapsible ladders as set forth in claim 3, wherein said two locking rod portions are differently radially spaced relative to said hinge pin.

7. The joint for collapsible ladders as set forth in claim 6, wherein both locking rod portions are formed as round-shaped rods of equal diameter, and said open-

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ings in said flange portions have a width in the radial direction which corresponds substantially to the diameter of the coaxing locking rod portion.

8. The joint for collapsible ladders as set forth in claim 2, wherein said biasing means is formed as a coil spring, said guide rod portion defining an annular space within said central bore of said hinge pin, and said coil spring being axially disposed within said annular space.

9. The joint for collapsible ladders as set forth in claim 8, including at least one bushing slidably axially mounted within said central bore in said annular space, and a second coil spring coaxially mounted between said guide rod portion and said bushing, said coil spring abutting with one end against said hinge pin and with the other end against said bushing and said second coil spring abutting with one end against said bushing and with the other end against said guide rod portion.

10. The joint for collapsible ladders as set forth in claim 9, wherein said hinge pin, said guide rod portion and said bushing have substantially equal axial lengths.

11. The joint for collapsible ladders as set forth in claim 10, wherein said rod portion has at its free end a radially outward projecting first collar, said hinge pin has, at the end distance from said first collar when the

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locking member is in the locking position, a second radially inwardly projecting collar, and the bushing has, at the end adjacent to the first collar of the guide rod portion when the locking member is in the locking position, a third radially outward projecting collar and at the other end a fourth radially inward projecting collar, whereby the outer diameter of the first collar is larger than the inner diameter of the fourth collar and the outer diameter of the third collar is larger than the inner diameter of the second collar.

12. The joint for collapsible ladders as set forth in claim 11, wherein an opening is provided in each flange portion for each angular position in which the ladder is to be locked in position by the passage of a locking rod portion and the corresponding openings in each flange portion only overlap when these angular positions are assumed by the flange portions.

13. The joint for collapsible ladders as set forth in claim 12, wherein one of said overlapping openings in one of the flange portions when the two flange portions assume an acute angle relative to each other, is formed as a concentric circular slot with respect to the hinge pin which permits a swinging of both shaft portions when the locking member is in the locking position.

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