June 14, 1960 W. B. ZERN 2,940,485

WOODWORKING APPARATUS FOR CUTTING A MITER ON TRIM AND DOOR STOPS

Filed Aug. 29, 1957 2 Sheets-Sheet 1

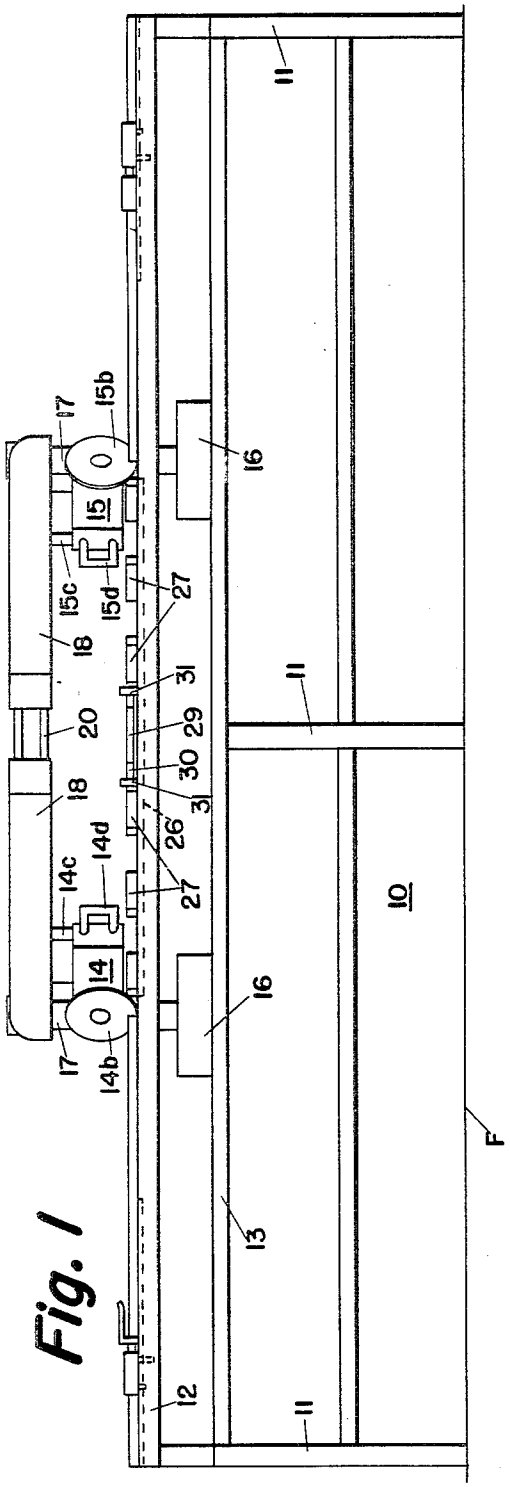


Fig. 1

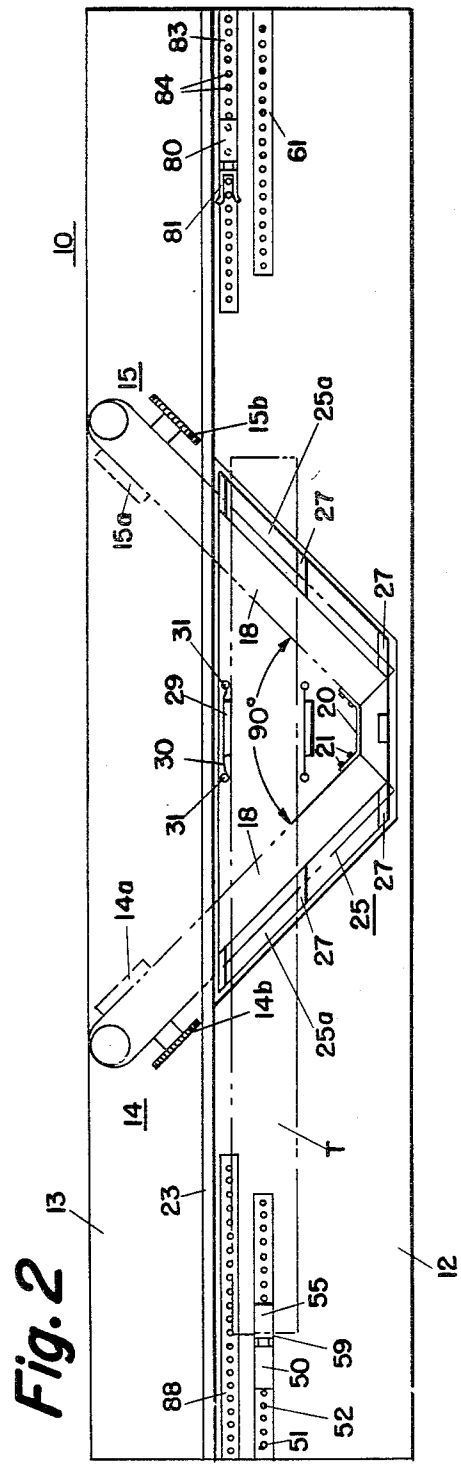


Fig. 2

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Fig. 3

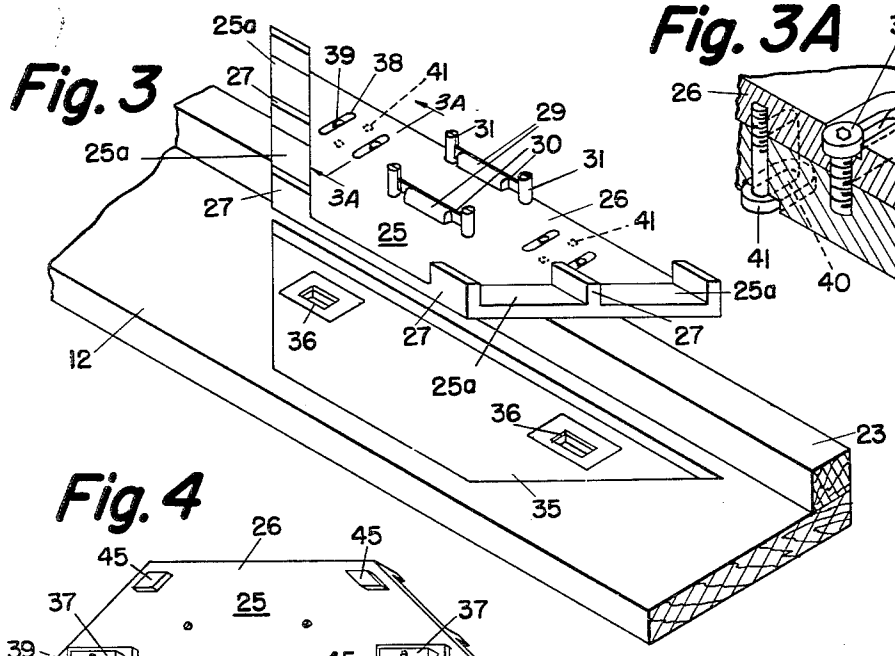


Fig. 3A

Fig. 4

Fig. 5

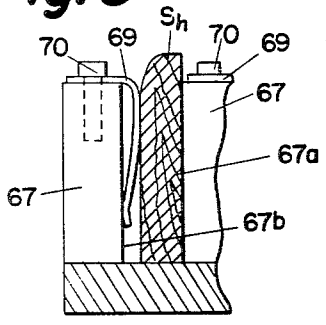


Fig. 6

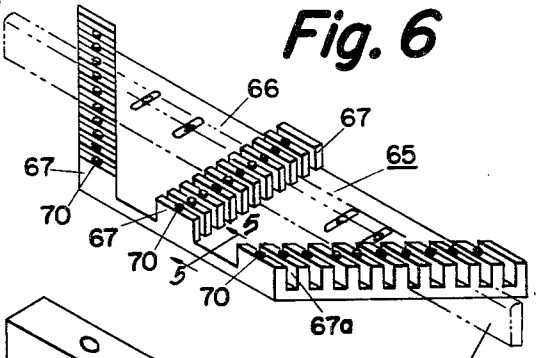


Fig. 7

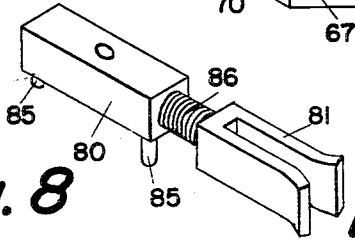


Fig. 8

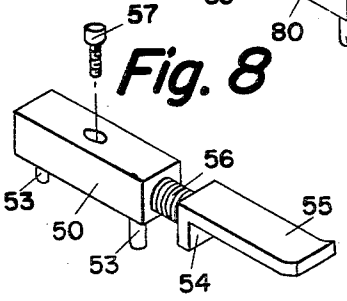
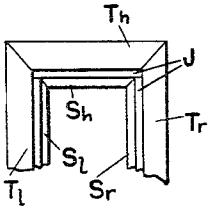


Fig. 9



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2,940,485

WOODWORKING APPARATUS FOR CUTTING A MITER ON TRIM AND DOOR STOPS

Warren B. Zern, R.D. 3, near Pottstown, Pa.

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11 Claims. (Cl. 143—38)

This invention relates to woodworking apparatus and has for an object the provision of improved means for cutting trim and door stops with the proper miter to form miter joints on door frames. Although not limited thereto, the invention is particularly applicable to cutting the miter or bevel on the trim strips nad door stopping for use on pre-hung doors. The present invention enables even an unskilled workman to cut the proper miter on trim strips and door stops both quickly and accurately so that when the door stops and trim strips are formed into miter joints around the door frame, they will fit perfectly and provide a good appearance.

One of the most difficult jobs in preparing trim strips for doors or windows is to cut the various pieces to the correct length and with the proper miter, so that when the head trim and side trim are assembled around the frame, their corresponding ends will form tight close-fitting miter joints. If only a slight error in dimension is made, the adjoining ends of the trim will be spaced apart and will not present a tight-fitting miter joint. This results in a poor-fitting joint and one which presents a poor appearance and is not acceptable in the building trade.

The present invention is adapted to eliminate the foregoing difficulties and insures that the miter cuts on the dor trim and door stop will be accurate and form tight-fitting miter joints when assembled. In accordance with the present invention there is provided a work table over which extend two rotary blade power saws of the radial arm type. The free ends of the arms are locked together so that the tracks along which the saws are adapted to more form an angle therebetween of precisely 90°. A work holder is disposed on the table between the saw tracks and is adapted to receive a piece of work, such as trim strips or door stop strips. The two saws are adapted to be moved separately to cut the miters on the side trim and the side stops, or they can be moved together to concurrently cut off the ends of a head stop or the head trim. The important dimension in cutting the head trim is to maintain the dimension along the inner edge of the trim. This is the dimension that must fit at the head of the door where it engages the two side trim pieces to form the miter joints. The work holder is of novel design and is adapted to locate the head trim from the inner edge adjacent the jamb and thus eliminate errors which occur due to the non-uniform width of the trim strip.

The two most common types of trim used today are those known by the names "Colonial" and "Ranch." These trim strips are shaped in a mill before they are delivered to the lamber yards. While the trim strips are supposed to be cut to various standard widths, it is a well known fact today that trim strips do not run true in width throughout their length and vary from strip to strip by as much as one-eighth inch or more. Such variations in width of the trim strips have caused considerable difficulty in the past for workmen when they form these strips into miter joints around the frame of a door

or window. The present invention eliminates this difficulty, and it does not matter if the trim is wider or narrower than the standard width since the dimension along the inside edge of the trim is maintained accurately during the miter-cutting operation.

It is a further object of the invention to provide close fitting miter joints on the trim by cutting feather edge miters. This is accomplished by supporting a trim strip in a horizontal plane at a pair of spaced locations. The trim strip is pressed downwardly between the spaced locations to bow the trim strip and cause the ends thereof to be raised above the horizontal plane. While the trim strip is held in this bowed position, at least one of the ends of the trim strip is cut off at an angle of 45° with respect to its length and along a plane perpendicular to the horizontal plane. This provides a feather edge miter along the upper surface of the trim strip which is the exposed surface of the trim strip when it is placed around a door frame and formed into miter joints at the head end of the door frame. In the case of a head trim strip, both of its ends are cut off at 45° angles, whereas only one end is cut at a 45° angle on the two side trim strips.

Further in accordance with the invention, there is provided a novel work holder for holding door strips during the miter-cutting operation, and each of the novel work holders employs spring-biasing means for forcing the respective stop strims and trim strips against a locating surface.

For a more detailed disclosure of the invention and for further objects and advantages thereof, reference is to be had to the following description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a front elevation of apparatus embodying the present invention;

Fig. 2 is a top plan view of the apparatus shown in Fig. 1;

Fig. 3 is an exploded fractional view in perspective showing the novel work holder of Figs. 1 and 2 in raised position above the work bench;

Fig. 3A is a fractional sectional view taken along lines 3A—3A in Fig. 3;

Fig. 4 is a bottom view of the work holder shown in Fig. 3;

Fig. 5 is a fractional sectional view showing the spring-biasing means of the work holder taken along the lines 5—5 in Fig. 6;

Fig. 6 is a perspective view of the work holder for the door trim;

Fig. 7 is a perspective view of an end locater for the door stop;

Fig. 8 is a perspective view of an end locator for the trim strips; and

Fig. 9 is a fractional view of a door frame showing miter joints formed by trim strips and door stopping.

Referring to Fig. 1, a work table **10** is shown supported on a floor F. The table **10** includes a plurality of vertical legs **11** which are adapted to support a horizontally disposed table top **12** on which the work, for example, door trim strip or door stop strip, is adapted to be positioned. The table **10** also includes another horizontal section **13** which is adapted to support a pair of rotary blade power saws **14** and **15**. The power saws **14** and **15** may be of any suitable type; however, they have been illustrated as radial arm saws which are well known in the woodworking trade. Briefly, each of the saws **14** and **15** includes base **16** above which projects a vertical post **17**. One end of an arm **18** is connected to the top end of the post **17**, the arm including a track along which the power saw is adapted to move. Each of the power saws **14** and **15** includes an electric motor **14***a*, **15***a*, Fig. 2, the respective shafts of which are provided with a rotary saw blade **14***b* and **15***b*, respectively.

Each of the motors **14***a* and **15***a* is supported in its respective carriage **14***c*, **15***c*, which is adapted to slide along the tracks in the respective arms **18**. Each saw is provided with a handle **14***d* and **15***d*, so that the saws may be moved individually along their respective tracks.

As may be seen in Figs. 1 and 2, the outer or free ends of the arms **18** which include the tracks are locked together by a pair of brackets **20**. The brackets **20** are adapted to be secured to the ends of the arms **18** by suitable means, for example, as by screws **21**, Fig. 2. As will be seen in Fig. 2, the brackets **20** lock the arms and thus the tracks for the saws, together so as to form an angle therebetween of precisely 90°. At the rear of the table top **12**, there is provided a fence or guard **23**. The fence **23** extends lengthwise of the table, and is perpendicular to a line bisecting the angle formed between the tracks for the two saws. In front of the fence **23** and between the two saws **14** and **15** is a work holder **25**. The work holder **25** is adapted to support the work, illustrated in Fig. 2 as a trim strip T, lengthwise of the table top **12** and precisely perpendicular to the bisector of the right angle formed between the tracks in the arms **18** for the saws **14** and **15**.

The work holder **25** (Figs. 3 and 4) preferably is formed from metal, such as for example, as an aluminum casting. It comprises a bottom plate **26** in the shape of an isosceles trapezoid, having a pair of parallel sides of unequal length and a pair of angular sides which are inclined at 45° which is the angle of the miter. These sides are provided with a plurality of projections **27** spaced apart a distance somewhat greater than the width of the trim strip T placed therebetween. This relationship may be seen in Fig. 2. The work holder **25** serves to support the trim strips during the cutting of both the side trim T_l, T_r and also the head trim T_h, Fig. 9. The projections **27** are adapted to serve as locating surfaces for the trim strips. The trim strips are inserted in the work holder **25** with the inner edge of the trim strip being in engagement with the surface of member **27**. This is accomplished by means of a spring-biased device illustrated in Figs. 2 and 3 as a cam member **29** which is supported on a flexible strip spring member **30**, the ends of which are held between a pair of posts **31**. It will be noted that in Fig. 3, the work holder **25** is provided with two complete sets of locating members **27** and spring-biasing devices **29—30**, and thus two different lengths of head trim strips may be cut with the same work holder. Thus, for example, the work holder **25** may be used for cutting the head trim for a door frame which is 24" wide and one which is 28" wide. It is to be understood that the work holder **25** may be constructed to cut head trim of any selected width. The trim is inserted in the work holder with the inner edge of the trim in engagement with the locating surfaces **27**, and the rear edge or outer edge of the trim is engaged by the cam surface **29**. The cam surface **29** is so positioned that in order to insert the trim in place on the raised portions **25***a* at the ends of the plate **26**, it will be necessary to bow the spring **30**. This insures that the front edge of the trim strip will be held tightly against the locating surfaces **27**, as illustrated in Fig. 2. When the trim strips are in place in the work holder **25**, they will rest on the raised portions **25***a*. When the miter is being cut, the operator can press the trim strip downwardly so that it engages the plate **26** between the raised portions **25***a*. This recessed construction of the work holder **25** permits the trim strip to be bowed slightly, thus providing a feather edge on the miter which will insure the formation of a perfect miter joint.

As may be seen in Fig. 3, the surface **12** of the table is recessed at **35** to receive the work holder **25**. The depth of the recess **35** is such that when the trim strips are inserted in the work holder **25**, they will rest on the surface of table **12** and also on the raised portions **25***a* of the work holder **25**. To accurately locate the work holder **25** in the recess **35** so that the saws **14** and **15** will cut off the ends of the trim strips at an angle of precisely 45°, the bottom of the recess **35** is provided with a pair of spaced openings **36** which are adapted to receive a pair of spaced locating blocks **37** which project from the bottom surface of plate **26** of the work holder **25**, Fig. 4.

As may be seen in Figs. 3 and 4, the locating blocks **37** are adapted to be secured to the plate **26** by a double locking arrangement. The upper surface of plate **26** is provided with elongated slots **38** through which extend screws **39**. The slots **38** are recessed, as shown in Fig. 3A, to receive the heads of the screws **39** so that the latter will not interfere with the trim strips. The lower threaded ends of the screws **39** are adapted to extend into the threaded openings in the locating blocks **37**, as shown in Fig. 4. Thus, the screws **39** may be moved lengthwise at the slots **38** and transversely of the plate **26** for adjustment purposes. As shown in Fig. 4, similar elongated slots **40** are provided in blocks **37** through which screws **41** are adapted to be received in threaded openings in the plate **26**, as may be seen in Fig. 3A.

The foregoing adjustment of the locating blocks **37** is provided for two purposes. First, it permits the work holder **25** to be adjusted with respect to the saws **14** and **15** so that the saw blades **14***b* and **15***b* will cut off the ends of the trim strip at angles of precisely 45°. The adjustment of the loacting blocks **37** also permits the operator to make small changes in the length of the head trim, T_h, Fig. 9, and thus control the amount of exposed jamb J along the edge of the trim. For example, in some installations, it is preferable to use a one-eighth inch exposed jamb, while in other installations it may be preferable to use a one-quarter inch exposed jamb, and in still some other installations, it may be preferable to use an exposed jamb of three-eighths inch. To change from a one-eighth inch exposed jamb set-up to a one-quarter inch exposed jamb set-up, it is necessary to increase the length of the head trim T_h by one-quarter inch. To accomplish this, the screws **39** and **41** are loosened in the loacting blocks **37** and the locating blocks moved with respect to the plate **26** so that the plate **26** sets farther toward the rear of the recess **35** in Fig. 3. The amount of adjustment is such that the length of the head trim T_h to be cut in the work holder **25** will be increased by the desired amount. To change to a smaller amount of exposed jamb J around the edge of the trim strips T_h, T_l, T_r, Fig. 9, the locating blocks **37**, Fig. 4, would be moved in reverse fashion with respect to the work plate **26**.

The locating blocks **37** are precisely machined so that they closely fit the openings **36** in the table **12**. The openings **36** are formed in metal blocks to insure that the work holder **25** will not move once the locating blocks **37** are inserted in the recesses or openings **36**. In order to prevent woodchips from tilting the work holder **25**, the bottom of the plate **26** is provided with four projections or raised portions **45** which are adapted to engage the bottom of the recess **35**. Thus the work holder **25** rests on the four projections **45** within the recess **35**, rather than the entire lower surface of plate **26** engaging the bottom of the recess **35**.

As may be seen in Fig. 2, a piece of trim T is inserted in the work holder **25** ready for cutting. It is to be noted that the inner edge of the trim T has been positioned against one set of the locating members **27** and the thick outer edge of the trim is engaged by the spring-biased member **29**, forcing the inner edge against the locating members **27**. In cutting a piece of head trim, T_h, both of the saws **14** and **15** are moved along their respective tracks **18** and thus both ends of the trim strip T are provided with miter cuts which are precisely at 45° with respect to the longitudinal axis of the trim strip T.

The same set-up as described above is also adapted for cutting the miter on the ends of the side trim strips.

To cut a left-hand trim strip, T_l, Fig. 9, a locating device **50**, Fig. 2, is employed to position the bottom end of the trim strip at the proper distance from the blade **15***b* of saw **15**. The table **10** is provided with a metal plate **51** which is recessed in the surface **12** and is provided with a plurality of openings **52** which are spaced apart a predetermined distance, for example, one inch. The locating device **50**, Fig. 8, is provided with a pair of pins **53** which depend from the body portion and are adapted to be received in the openings **52** in the metal strip **51** on the surface of the table. One end of the device **50** is provided with a locating member having a vertical portion **54** which is adapted to engage the flat end of the trim strip T and a horizontal portion **55** which is adapted to overlie the trim strip T in the manner illustrated in Fig. 2. For small adjustments of the vertical portion **54** of the locating member lengthwise of the table **10**, there is provided a plurality of washers **56** located between the body member and the vertical portion **54**, Fig. 8. Once the locating device **50** has been properly positioned for locating the side trim T_l relative to the saw **15**, it may be locked to the table by means of a bolt **57** which is adapted to extend through the body member into the strip **51**.

With the trim strip in place, as shown in Fig. 2, the miter at the head end of the strip is cut by moving the saw **15** along its track toward the operator. The saw **14** is not used during this operation. To cut a right-hand trim strip T_r for the other side of the door frame, the locating device **50** is moved to the opposite end of the table **10** and inserted in the proper opening in a strip **61** which corresponds to strip **51**, described above. For convenience, the table **10** may be provided with a pair of locating devices **50**, one to cooperate with each of strips **51** and **61** at the opposite ends of the table. It will be seen that when the trim strip T is inserted at the opposite end of the table, the miter will be cut by saw **14** in a similar manner to that of saw **15**, previously described. Thus, it will be seen that the pair of saws **14** and **15** are used not only to cut side trim strips T_l, T_r, but also the head trim strip T_h.

The saws **14** and **15** are also used to cut the door stopping S_l, S_h, S_r which is to be mounted along the jambs J of the door frame in a manner illustrated in Fig. 9. A work holder **65**, Fig. 6, is adapted to be mounted in the recess **35** in the table top **12** in a similar manner to the work holder **25**. The work holder **65** comprises a bottom plate **66** having a plurality of sets of projections **67** which extend thereabove. The sets of projections form a plurality of slots or recesses corresponding in length to the widths of various door frames, for example, from 18" to 36". The projections **67** are each provided with a locating surface **67***a* against which the door stop strips are adapted to be held. The surface of the door stop strips which engages the jamb is held against the locating surface **67***a* of the work holder by means of a spring **69** which is L-shaped and one end of which extends into the recess between the sets of projections **67** and is adapted to engage the surface **67***b*, as shown in Fig. 5. The springs **69** are secured to the respective projections **67** by means of screws **70**.

The work holder **65** for holding the door stop members is used in a similar manner to the work holder **25** described above. In cutting the head stop S_h, the work is inserted in the appropriate slot formed by the set of projections **67** corresponding to the width of the door frame opening. The flat or rear surface of the head stop S_h which engages the jamb is the surface which must be cut accurately to length. It is for that reason that this surface is held against the locating surface **67***a* in the work holder **65**. Thus, if the door stop material varies in thickness, it will still be cut to the proper length. The miter cuts are made at the ends of the head stop S_h by moving both of the saws **14** and **15** along their respective tracks **18** in the manner described above in connection with cutting a head trim strip T_h. To cut a side door stop member, S_l or S_r, the strip material is placed in the first one of the slots on the work holder **65** adjacent the fence **23** on the table. It will be noted that in Fig. 2, the surface **12** of the table **10** is provided with a locating device **80** which is adapted to engage the bottom end of a side door stop strip. The locating device **80** is similar to the device **50** employed in connection with side trim strips T_l, T_r except it is provided with a U-shaped member **81** which is adapted to receive the bottom end of a door stop strip. Since the door stop strips are inserted vertically in the work holder **65**, they are likewise inserted vertically along their edges into the U-shaped member **81**, Fig. 2. The table is provided at its right-hand end with a metal strip **83**, having a series of openings **84** which are adapted to receive the pins **85** which project from the bottom of the device **80**. For small adjustments in spacing, the U-shaped member **81** is separated from the body portion of device **80** by a series of washers **86** similar to the washers **56** used on device **50**. A strip **88** similar to strip **83** is located at the opposite end of the table top **12**, as shown in Fig. 2. When the locating device **80** is positioned in the strip **83** at the right-hand end of the table, as shown in Fig. 2, the saw **14** is used to make the miter cut at the head end of the door stop strip S_r. To cut the door stop strip S_l for the opposite side of the door, the device **80** is positioned in the corresponding holes of strip **88** at the opposite end of the table and saw **15** is used to make the miter cut at the head end of that door stop strip.

From the foregoing description, it will be seen that the apparatus provides an arrangement whereby the door trim T and the door stops S will be cut accurately to length and the miter cuts will be precisely at 45° with respect to the length of the strips and thus will form perfect miter joints at the upper corners of the door frame, Fig. 9. This apparatus not only permits the operator to be assured that his miter joints will fit perfectly but also enables him to cut the trim strips T and door stop strips S much more rapidly than in the past.

Although it has been described as a preferred embodiment of the invention, it will be understood that further modifications may be made without departing from the spirit and scope of the invention, as set forth in the appended claims.

What is claimed is:

1. Apparatus for cutting miters on work such as trim strips for doors or the like to form precise miter joints, comprising a table having a horizontal section on which the work is adapted to be positioned, a pair of saws, each of said saws having a rotary blade, a pair of vertical supports for said saws, each of said saws having a horizontal overhead track to guide the movement of said blades along straight horizontal cutting paths corresponding to the positions of said tracks, said pair of supports for said saws being spaced apart at the rear of said table, said tracks being connected at their rear ends to the respective supports so that they extend radially therefrom, the outer end of each track for the respective saws being locked to that of the other to maintain said tracks at an angle therebetween of 90°, a workholder on said table for supporting work between and below said tracks and across said cutting paths of said saws, said workholder including guide structure for positioning the longitudinal axis of the work along a line perpendicular to the bisector of said 90° angle so that movement of said saws along their respective tracks will cause said saw blades to cut the ends of the work at angles of precisely 45°, and a recess in the upper surface of said table, said recess having a configuration corresponding to the configuration of said workholder for receiving said workholder therein.

2. Apparatus according to claim 1 wherein said recess and said work holder are shaped in the form of a trapezoid, the angular sides of which are respectively parallel to said tracks for said saws.

3. Apparatus according to claim 1 including locating means disposed at the ends of said table and cooperat-

ing with said workholder to hold the work for the cutting of side trim strips.

4. Apparatus according to claim 1 wherein said work holder includes a bottom plate adapted to be received in said recess, and structure on said plate adapted to cooperate with structure in said recess to locate said workholder and hold it in a predetermined position relative to the bisector of said 90° angle, said structure on said plate being adjustable to move the longitudinal axis of the work perpendicular to said bisector of said 90° angle to vary within narrow predetermined limits the length to which the work is cut by said pair of saws.

5. Apparatus according to claim 1 wherein said workholder includes a plate having structure adjacent the paths of the saws for supporting the work at a predetermined elevation, the central area of said plate being lower than said work-supporting structure, whereby the work may be pressed against said central area so as to bow the work and enable said saws to cut a feather edge at the ends of the work.

6. Apparatus according to claim 1 wherein said workholder includes a bottom plate adapted to be received in said recess, an opening in the bottom of said recess, said opening having a metal lining, said bottom plate having a locating block projecting from the bottom surface thereof and having a configuration corresponding to the configuration of said metal-lined opening in said recess, said locating block being adapted to be inserted in said metal-lined opening for precisely positioning said workholder relative to said tracks of said saws.

7. Apparatus according to claim 6 wherein said bottom plate of said workholder is provided with at least three raised portions which are adapted to engage the bottom of said recess in said table and support said bottom plate at a location above the bottom of said recess.

8. In apparatus for cutting miters on work pieces such as trim strips and stop strips for doors or the like, a workholder adapted to be supported horizontally on a work table, said workholder comprising a plate formed in the shape of an isosceles trapezoid having a pair of parallel sides of unequal length and a pair of angular sides, said angular sides being inclined at angles of 45° with respect to the longer one of said parallel sides, adjustable locating means projecting from the bottom surface of said plate for cooperation with the work table to position said work holder in predetermined position relative to the work table, locating structure on said plate and extending thereabove, projecting structure on said plate facing said locating structure and spaced a predetermined distance therefrom, and resilient biasing structure carried by said projecting structure and facing the adjacent said locating structure for cooperation with said locating structure to hold the work piece therebetween, said resilient biasing structure including a resiliently supported cam surface normally spaced from said cooperating locating structure a distance less than the corresponding dimension of the work piece to be inserted therebetween, said cam surface being curved downwardly from the top of the resilient biasing structure into the work-receiving recess formed between said projecting structure and said adjacent locating structure so that the work piece may be readily inserted and withdrawn from the top of said workholder.

9. A workholder according to claim 8 wherein said locating structure is positioned adjacent the shorter one of said parallel sides and said resilient biasing structure is positioned adjacent the longer one of said parallel sides.

10. A workholder according to claim 8 wherein said locating structure is positioned adjacent the longer one of said parallel sides and said resilient biasing structure is positioned adjacent the shorter one of said parallel sides.

11. A workholder according to claim 8 wherein the upper surface of said plate includes spaced raised portions adjacent the angular sides thereof for engaging the bottom of the work.

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