United States Patent [19]

Skold

[11] **3,789,491**

[45] **Feb. 5, 1974**

[54] **APPARATUS FOR JOINING AND SUPPORTING CROSSWISELY EXTENDING REINFORCING BARS**

[76] Inventor: **Mats Folke Skold,** Backvagen 78, Hagersten, Sweden

[22] Filed: **Feb. 28, 1972**

[21] Appl. No.: **229,703**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 3,765, Jan. 19, 1970, Pat. No. 3,694,988.

[30] **Foreign Application Priority Data**

Mar. 2, 1971 Sweden 2619/71

[52] **U.S. Cl.** ..... **29/212 R**

[51] **Int. Cl.** **B23q 7/10**

[58] **Field of Search** 29/212 R, 212 D, 211 D, 211 R, 29/155, 212 P

[56] **References Cited**

UNITED STATES PATENTS

3,461,536	8/1969	Skold	29/212 R
3,694,988	10/1972	Skold	52/678

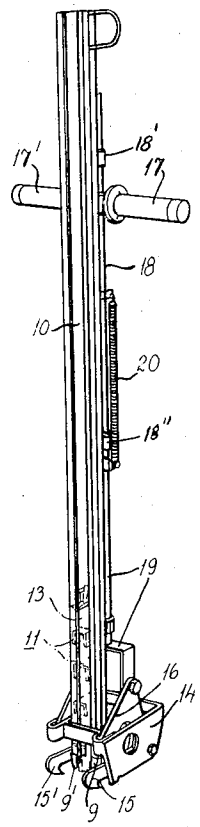
Primary Examiner—Thomas H. Eager

Attorney, Agent, or Firm—Eric Y. Munson

[57] **ABSTRACT**

Apparatus for joining crosswisely extending reinforcing bars at their intersection in preparation for casting concrete slabs and the like and supporting them in elevated position above the casting mold by means of a clip having an inverted generally U-shaped body in which the upper one of the bars is resiliently maintained in contact with the lower one of the bars which is seated in a recess, the axis of which extends transversely to and below the upper rod.

17 Claims, 20 Drawing Figures



Patented Feb. 5, 1974 3,789,491

4 Sheets-Sheet 1

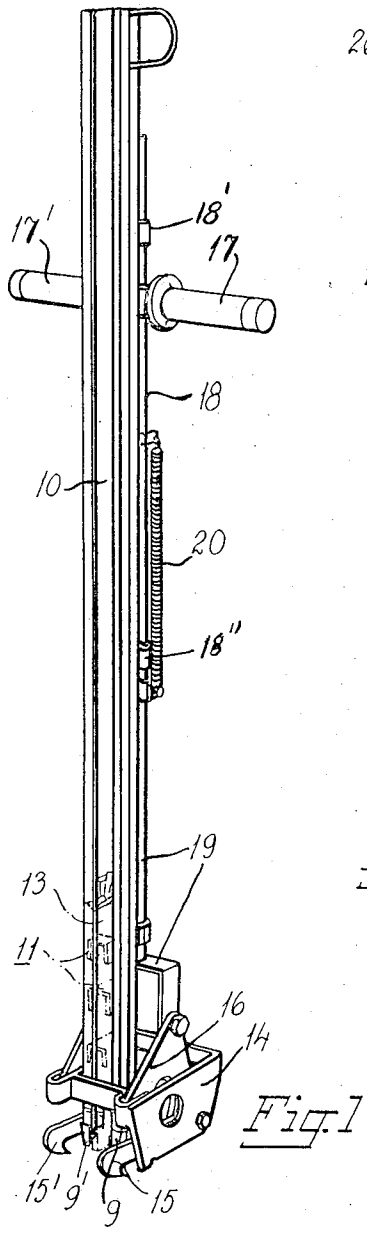


Fig. 1

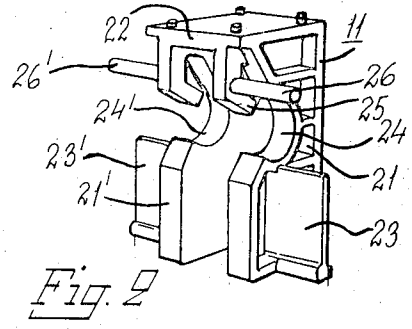


Fig. 2

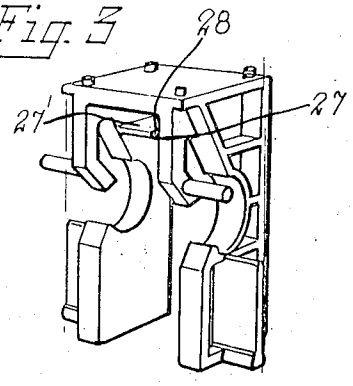


Fig. 3

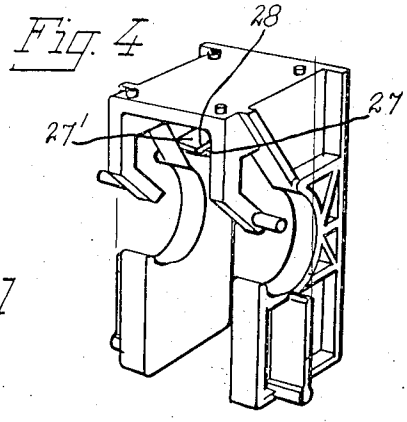


Fig. 4

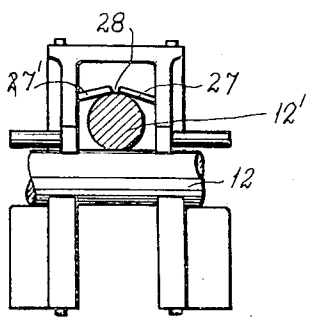


Fig. 5

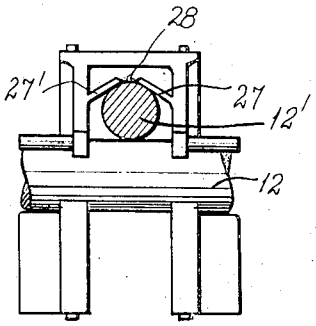


Fig. 6

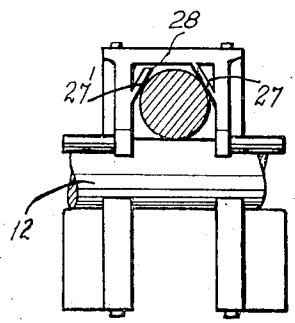


Fig. 7

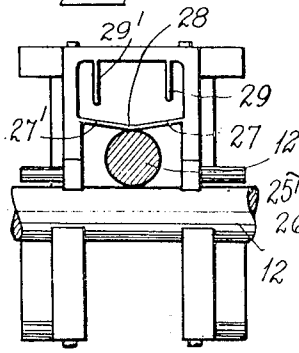


Fig. 9

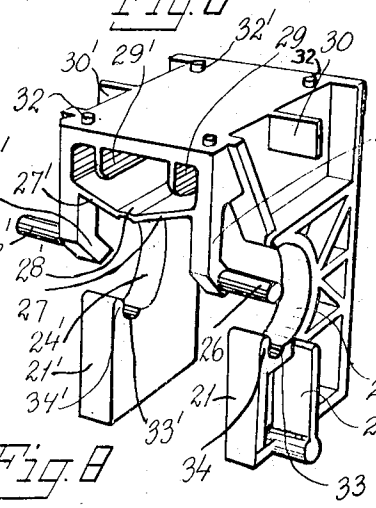


Fig. 8

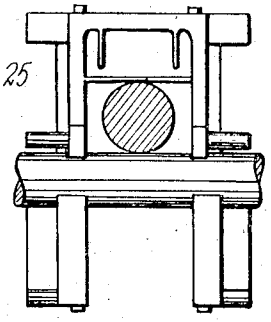


Fig. 10

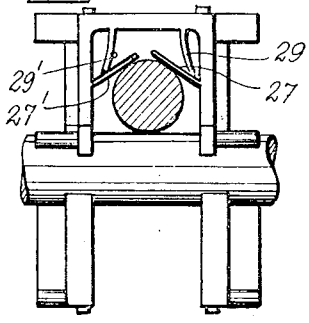


Fig. 11

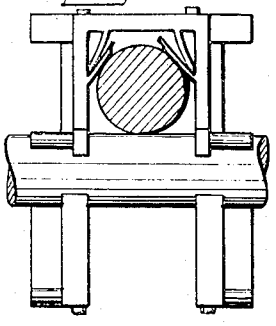


Fig. 12

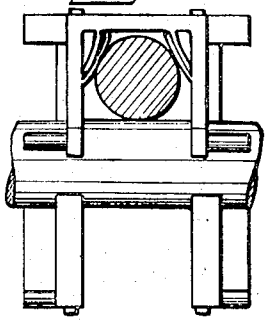


Fig. 13

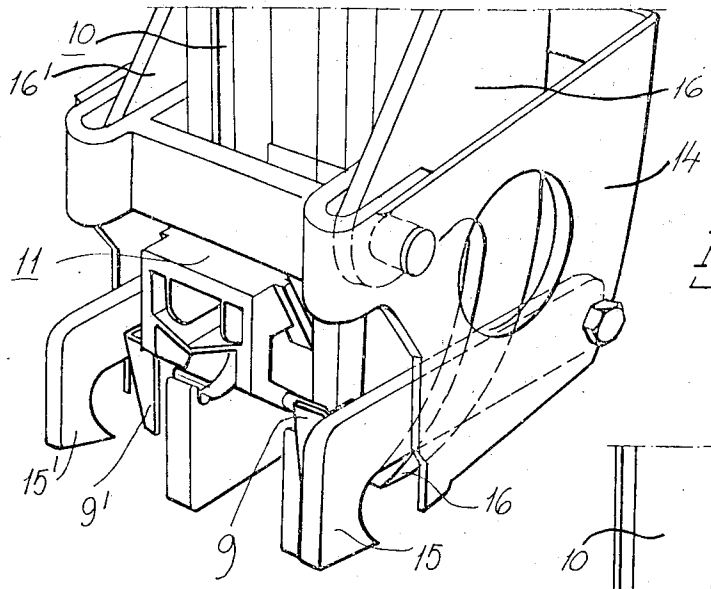


Fig.14

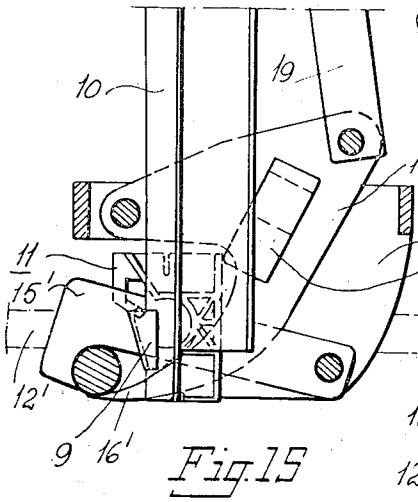


Fig.15

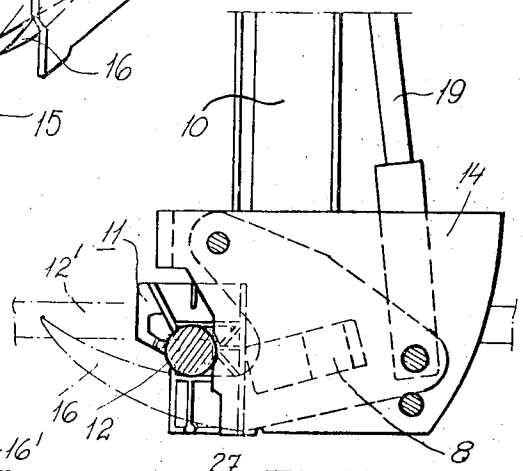


Fig.16

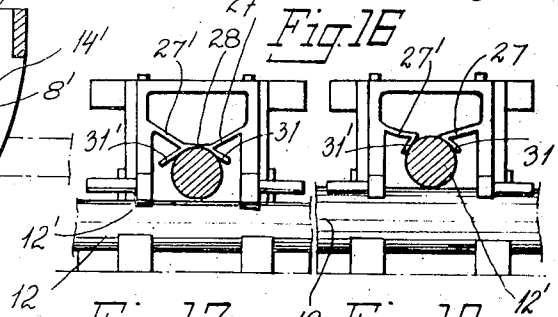


Fig.17 Fig.18

Fig. 19

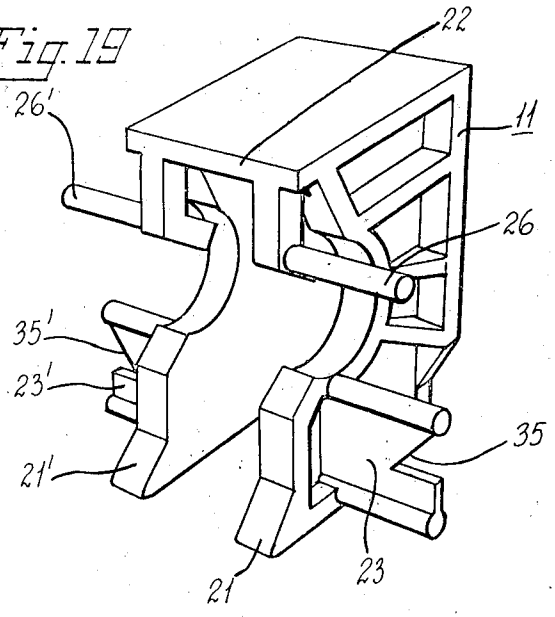
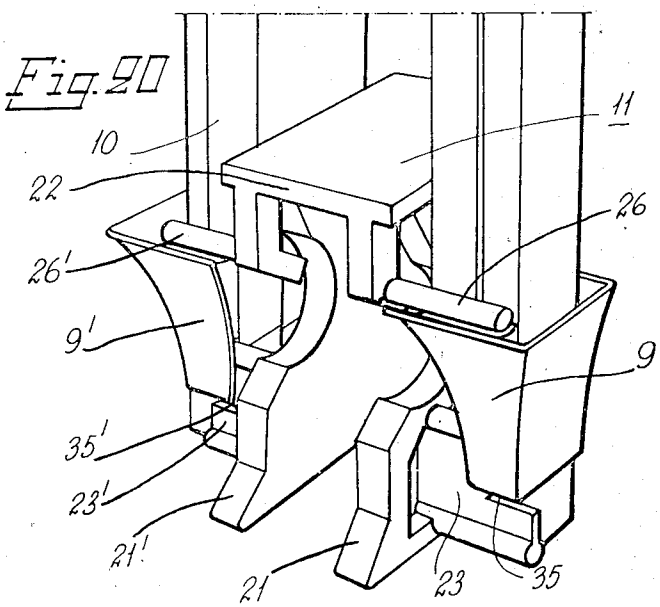


Fig. 20



APPARATUS FOR JOINING AND SUPPORTING CROSSWISELY EXTENDING REINFORCING BARS

BACKGROUND OF THE INVENTION

This application is a continuation-in-part of my co-pending application Ser. No. 3,765 filed Jan. 19, 1970, now U.S. Pat. No. 3,694,988 dated Oct. 3, 1972.

In the practice of casting concrete slabs and the like reinforcing bars of steel or other material are laid on the deck of the mold form in crosswise directions. In the past these reinforcing bars were tied together at their intersection by wire and raised above the deck by tying them to wire supports. For the purpose of alleviating the labor and reducing the installation cost, spacer clips have been used to replace the outmoded method of tying the reinforcing bars together by wire. An example of such spacer clip is shown in applicant's U.S. Pat. No. 3,461,536. Another example of such a clip is shown and described in applicant's co-pending application Ser. No. 3,765 filed Jan. 19, 1970, now U.S. Pat. No. 3,694,988 dated Oct. 3, 1972. It will be noted that such spacer clip not only ties the reinforcing bars together at their intersections, but also supports and secures them in place at a spaced distance above the deck. Therefore, this type of spacer clip provides support and stability for the reinforcement mat and working loads created by workmen on the project will not depress the spacer clip, such as is the case with wire supports. Thus, the desired concrete cover for the bottom of the slab to be poured is ensured.

The spacer clip may be applied manually to the reinforcing bars or by means of a tool as disclosed in applicant's U.S. Pat. No. 3,461,536. This tool comprises a magazine or a channel having an opening at the lower part thereof from which the spacer clips are ejected. The foot of the tool or gun is placed over two intersecting bars and when the clip is forced out from the magazine or channel by pressure exerted on the handles, the reinforcing bars are automatically locked into position spaced above the deck of the mold.

The spacer clips or clip chairs as they are commonly called in the industry are all plastic and usually are molded in cartridges of five or more in each cartridge for quick loading into the gun.

Many times during inspection of reinforcing steel placement, the inspector requires that additional supports may be needed in certain areas. The spring clip or clip chair according to the invention can be readily applied to any such area by means of quick application with the tool or gun and elimimates having to raise the steel to install additional supports, as is common when supporting reinforcing steel with wire bar supports. Reinforcing bars for floor, slabs can be tied in place, spaced and supported in one operation. This operation can be carried out from a comfortable standing position and does not involve any bending or crouching.

PURPOSE OF THE INVENTION

The primary object of the present invention is to provide a tool or a gun which is an improvement of the device shown and described in applicant's U.S. Pat. No. 3,461,536, and of the spacer clip or clip chair shown and described in applicant's co-pending application Ser. No. 3,765, now U.S. Pat. No. 3,694,988.

The tool described in said U.S. Pat. No. 3,461,536 was designed primarily for the application of a spacer clip as shown in said patent and for reinforcing bars of relatively light weight and cross section.

Therefore, among the objects of the present invention is to provide a tool or a gun which lends itself for lifting and tying together bars of substantially heavier weight and having larger and varying cross sections as well as to lighter weight bars of smaller cross sections. Furthermore, modern day casting methods often call for bars being tied together suspended above the deck of the mold when the tool should not be placed on the floor itself of the casting mold and when they are not to be further elevated.

Another object according to the present invention contemplates the provision of a spacer clip or clip chair which can be used for reinforcing bars of various thicknesses or sizes, whereby the number of sizes of the spacer clips can be reduced considerably, with consequently reduced manufacturing costs, due to the fact that a smaller number of tools will be necessary for the manufacturing of the spacer clips.

A further valuable improvement resides in the fact that the spacing member, having been attached to the reinforcing bars, is effectively locked thereto which will prevent the spacing members from working loose from the reinforcing iron bars when the concrete is poured or subjected to traffic.

A further improvement resides in the fact that the spacer clip with a spring action makes contact with the reinforcing iron bars, which will prevent creation of material stresses in the spacing member, which otherwise can cause the spacing member to crack under the mechanical stresses produced by the vibrating rod when pouring the concrete around the spacing members.

A further improvement of the spacer clip resides in the fact, that it can easily be attached to the reinforcing iron bars manually without a tool, if necessary, since it is provided with flexible parts, which will permit the use of minimal manual power to fix the spacing member to the reinforcing iron bars. Thus, there is no necessity to squeeze or press the spacing member to the reinforcing iron bars since the spacing members will slip or snap on to the same without difficulty.

The invention furthermore contemplates an improved construction which adapts itself for practical and convenient use in combination with a tool or gun which comprises a fliting mechanism for the elevation of the reinforcing bars into a tied or locked position without risk of lateral displacement of the lower bar from its predetermined location in the mold form. This feature becomes of particular importance when handling reinforcing bars of large cross section and heavy weight.

SUMMARY OF THE INVENTION

The tool according to the invention comprises an open ended elongated magazine or channel which has a cross section substantially corresponding to the cross of the spring clips so that they will be yieldingly retained therein.

The spacer clip or clip chair according to the invention comprises two side members or legs which are joined in spaced relationship from one another by means of a bridging member to form an inverted generally U-shaped body into which the upper one of the crosswisely extending reinforcing bars is inserted.

The legs or side members are provided with laterally extending support members. Each leg or side member has an open recess having a bar or rod engaging surface. The axis of the recess extends substantially at a right angle to the upper one of the bars and is spaced a distance below the bridging member so as to insure abutting contact between the two bars when they are seated or locked in their position in the clip chair. The legs and/or the bridging member are provided with resilient members for guiding and maintaining the upper bar in forced contact with the lower bar. The opposing resilient edge portions of the members may be provided with guide flanges which engage the upper reinforcing bar.

The spring clip according to the invention is provided with a pair of spring members each extending from its respective side member or leg across the opening formed by the recesses and are adapted to be deflected by the inserting movement of the lower bar to spring back when the bar becomes seated in the recess.

The spacer clip or clip chair according to the invention is preferably made of a plastic material known under the trademark LUPOLEN 6041 D which is a polyethelene product stabilized against deformation and oxidation under heat and is manufactured by Badische Anilin - & Soda-Fabrik AG.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a tool for application of spacer clips according to the invention.

FIGS. **2, 3** and **4** are perspective views of different embodiments of spacer clips according to the invention each one of which may be applied to the reinforcing bars by means of the tool shown in FIG. **1.**

FIGS. **5, 6** and **7** are front elevational views of the embodiment shown in FIG. **3,** each figure showing the application of the spacer clip to reinforcing bars having a different cross-sectional area.

FIG. **8** is a perspective view of a modification of the spacer clip according to the invention.

FIGS. **9, 10, 11, 12** and **13** are front elevational views of the spacer clip shown in FIG. **8** arranged with different combinations of reinforcing bars of different cross-sectional areas.

FIG. **14** is a perspective view drawn to an enlarged scale of the lower part of a tool by which the spacer clip is applied.

FIG. **15** is a side view of the lower part of the tool, partly in cross-section, in a preliminary stage of a lifting operation.

FIG. **16** is a side view of the lower part of the tool with a spacer clip, in which the reinforcing bars are joined by means of the engaging members in the tool.

FIG. **17** is a front elevational view of the upper part of a modified spacer clip provided with flexible support members having projecting guiding members for contacting and guiding the upper reinforcing bar to the center of the spacing element.

FIG. **18** is a similar view of the spacing element, showing the function of the support members and the guiding parts when applied to a reinforcing bar having a larger cross-sectional area.

FIG. **19** is a perspective view of a modified spacer clip with notched support members.

FIG. **20** is a perspective view of the lower part of the tool having a spacer clip in position for application to the reinforcing bars as shown in FIG. **19.**

Referring to the drawings the reference numeral **10** indicates an elongated magazine in the tool or gun into which a number of spacer clips **11** in the form of a cartridge are loaded. The tool is held downwardly when applying spacer clips **11** to the crosswisely extending reinforcing bars **12, 12'**. A weight **13** may be placed on the uppermost spacer clip **11** which is intended to exert a downward load on the spacer clips to cause them to move toward a discharge opening in the end of the magazine **10.** The tool is provided with a support member **14** on which hookshaped restraining members **15, 15'** are pivotally mounted for engaging the underlying reinforcing bar **12.** The crank arms **16, 16'** for raising the reinforcing bars **12, 12'** into their seated position in spacer clips **11** are also pivotably mounted on the support member **14.** The crank arms **16, 16'** are connected by means of a linkage system to handles **17, 17'**, which are connected to the rod **18** which slidably engages the sleeves **18', 18'** which are mounted on the back of the tool behind the magazine. The forked lower end of the rod **18** is pivoted to the forkshaped rod **19,** which is in turn pivoted to the crank arms **16, 16'**. Expansion springs **20** are anchored at one end to the back of the tool and at the other end to the pivot connection between the rod **18** and the bar **19** which springs tend to maintain the rods and the bar under spring tension in a substantially aligned vertical position. The crank arms **16, 16'** are provided with clip ejector means for engaging the lowermost spacing clip **11.** The aforementioned movable members **15, 15', 16, 16', 18, 19** are arranged to eject the spacer clips **11,** one by one, from the discharge opening in the magazine **10** by the downward movement of the handles **17, 17'** and to elevate and join the crosswisely extending reinforcing bars **12, 12'** by means of the spacing elements **11** as shown in FIGS. **15** and **16.** The tying together of the crosswisely extending reinforcing bars **12, 12'** can also be carried out with the tool and the spacer clips **11** when the reinforcing bars **12, 12'** are arranged at a considerable distance above the floor of the casting mold. For this purpose, the magazine **10** is provided with funnel-shaped retainers **9, 9'** at its lower end, so as to locate the spacer clips **11** in a predetermined location before their ejection from the magazine.

The spacer clips **11** can also be used for manually elevating and/or tying together reinforcing bars **12, 12'** without the aid of a tool, but the tool facilitates the work considerably and makes it possible for workmen to carry out the operation from a comfortable standing practical position with consequent saving in time and labor.

The several modifications of the spacer clip according to the invention are constructed so that they all can be used in the same tool with consequent obvious advantages. The several embodiments of the spacer clips **11** can be modified and adjusted for various cross-sectional areas and thicknessess of reinforcing bars and combinations thereof.

In the drawings the spacer clips are indicated generally by the reference numeral **11** and the basic elements used in all of the embodiments have been given the same reference numeral. These basic constructions comprise the legs **21, 21'** which are joined and spaced apart by a bridging portion **22** to form an inverted substantially U-shaped body. The legs **21, 21'** are provided with laterally extending support members **23, 23'**. Each leg is provided with an open recess having a bar engag-

ing surface located a distance above the base of the mold for receiving and seating the reinforcing bars. Resilient hook-shaped members **25, 25'** extend from their associated leg members adjacent the bridging portion **22** across the openings of the recesses **24, 24'**. The hook-shaped resilient members are provided with perpendicularly projecting guide pins **26, 26'**. Since the abovementioned basic elements are included in all embodiments and also are clearly shown in the figures, the reference numerals have been excluded in most of the figures shown and the same applies to reference numeral **11** indicating the spacer clip in general.

In order to guide the spacer clip effectively in the magazine **10** of the tool during ejection therefrom, the distance between the vertical outer edges of the lateral support members **23, 23'** is maintained equal in all embodiments, said distance being indicated by vertical lines in FIGS. **2, 3** and **4.** The distance between the guide pins **26, 26'** and the lower ends of the legs **21,21'** is also maintained equal in all embodiments, since the guide pins **26, 26'** must fit the retainers **9, 9'** at the lower end of the magazine **10.**

The underlying reinforcing bars are indicated by reference numeral **12** and the overlying ones by **12'** in all embodiments shown, without any regard to their cross-sectional area.

In FIGS. **5, 6** and **7** are shown modifications of the spacer clip shown in FIGS. **3** and **4.** Said modifications show the spacer clip provided with opposing flanges **27, 27'** projecting from the inside surfaces of the legs **21, 21'** parallel with the bridging portion **22.** The flanges **27, 27'** can be joined to each other by means of a thin, frangible, plastic membrane **28.** The flanges **27, 27'** are flexible as shown in FIGS. **5, 6** and **7,** and intended to resiliently engage the overlying reinforcing bar **12'**. In FIG. **5,** the reinforcing bars **12, 12'** are shown as having the same cross-sectional area or diameter which is relatively small. In FIG. **6,** the underlying reinforcing bar **12** is shown as having a larger cross-sectional area than the overlying reinforcing bar **12'**. In FIG. **7** the reinforcing bars have the same diameter but are of a larger cross-sectional area than the bars of FIG. **5.** In all of the combinations of reinforcing bars **12, 12',** the flanges **27, 27'** engage the bars under spring tension.

In FIGS. **8, 9, 10, 11, 12** and **13** are shown a modification of the spacer clip, which is applicable for an even greater range of combinations of reinforcing bars **12, 12'** of different cross-sectional areas of thicknesses. In said modification, the bridging portion **22** is provided with two supplemental flanges **29, 29',** projecting from the bridging portion and extending parallel to the legs **21, 21'** towards the free ends of the legs. The supplemental flanges **29, 29'** may be flexed sidewise to cooperate with the flanges **27, 27'** to form a resilient contact with the overlying reinforcing bar.

In FIG. **9** is shown two reinforcing bars **12, 12'** having the same relatively small cross-sectional area. In FIG. **10** is shown an underlying reinforcing bar **12** having a smaller cross-sectional area than the upper reinforcing bar **12'**. In FIG. **11** the two reinforcing bars **12, 12'** have the same cross-sectional area as the overlying bar shown in FIG. **10.** In FIG. **12** the underlying reinforcing bar has the same cross-sectional area as that of the corresponding bar shown in FIG. **11** while the overlying bar **12'** has a larger cross-sectional area. In FIG. **13,** both bars **12, 12'** have the same cross-sectional area as the overlying bar **12'** as shown in FIG. **12.** In all the modifications shown, the flanges **27, 27'** in combination with the supplemental flanges **29, 29'** exert a resilient contact with the overlying reinforcing bar. This is important for ensuring the locking of the two reinforcing bars into position in the spacer clip **11.** In the modifications shown in FIGS. **8–13** the clip is provided with flexible guide tongues **30, 30',** which project laterally from the legs **21, 21'** and which are intended to stabilize the spacer clip in the magazine **10.**

This modification is particularly applicable for the uppermost spacer clip, when a number of slips are joined together into the form of a cartridge. Improved guidance of the spacer clip in each cartridge is thereby ensured. Obviously, the guide tongues **30, 30'** can be of any shape, such as of circular or rectangular cross-section.

In FIGS. **17** and **18** are shown the upper part of a spacer clip according to the invention in which the flanges **27, 27'** are provided with end portions **31** and **31'** which incline towards the legs **21, 21'**. These will increase the resilient contact with the overlying reinforcing bar **12'** and guide it into a central position between the legs **21, 21',** regardless of the cross-sectional area of the reinforcing bar **12'**. As shown in FIG. **17,** the flanges **27, 27'** are joined to each other by means of a thin plastic membrane **28.**

The spacer clips **11** may be molded together into cartridges by means of frangible webs **32, 32'** which are sheared off as the spacer clips are individually ejected from the magazine.

FIG. **19** shows a spacer clip according to the invention in which th lateral support members **23, 23'** are provided with notches **35, 35'** which divide the members **23, 23'** into two sections. The bottom of the notches should be located so that the vertical height of the lower section is equal to or lesser than the distance between the lowest point of the magazine **10** and the bottom horizontal edge of the funnel retainers **9, 9'.** By inclining the upper edges of the notches **35, 35',** the upper section of the supporting members **23, 23',** will be reduced in area with a consequent reduction of the force exerted on the retainers **9, 9'** during the ejection of the spacer clips from the magazine.

Spacer clips according to the invention which are designed for tying or locking together reinforcing bars of large cross-sectional area or thickness are preferably provided with grooves **33, 33'** adjacent the bottom front edge portion of the recesses **24, 24'** thus producing supplemental restraining means which will serve to restrain any unintended disengagement of the lower reinforcing bar **12** from the recesses **24, 24'.**

The spacer clips are molded from a resilient synthetic plastic material, as described herein, which results in a self sustaining but still resilient article which lends itself to ejection from the tool, as well as to support and lock the reinforcing bars into position. The polyethylene known under the trademark LUPOLEN 6041 D referred to herein has been found particularly suitable, because of its resistance to extreme hot and cold temperatures. It should be understood, however, that the invention is not limited to said synthetic plastic material, and other plastic materials may be used which meet the requirements of the invention.

It should be understood that the above description is given by way of example and not by way of limitation and the inventive concept disclosed herein may find a

variety of expressions within the scope of the appended claims.

I claim:

1. A tool for applying a spring clip to a pair of crosswisely extending intersecting superposed bars and to raise and seat them in said spring clip, said tool comprising:
   a. a channel member for slidably retaining a plurality of clips and having a discharge opening;
   b. restraining means pivoted to said channel member for engaging the underlying one of the bars to restrain it against lateral displacement with respect to the overlying bar when the tool is in clip discharging position;
   c. crank means pivoted to said channel member having finger means for engaging the underlying bar;
   d. linkage means pivoted at one end to said crank means at a point spaced from the pivot point to the channel member, and at the other end being slidably mounted on said channel member and being operable to move said finger means into engagement beneath the underlying bar and to lift it into the recess of said spacer clip, and
   e. ejector means carried by said crank means in a position for forcing a spacer clip from said discharge opening and maintaining it in contact with the bars as said crank means are being moved to lift the underlying bar into the recess of the clip.

2. The tool according to claim 1 in which the discharge end of the channel member is connected to a foot member having an opening accommodating the intersecting bars and to the opposite sides of which are connected said crank means and said restraining means.

3. The tool according to claim 2 in which the linkage means comprises a connecting rod connected at one end to said crank means at a distance spaced laterally from the channel member the other end being pivoted to a pusher rod slidably mounted on said channel member.

4. A tool for tying together crosswisely extending intersecting superposed bars in an inverted generally U-shaped spacer member of resilient plastic material, the legs of which are provided with an open recess having a rod receiving surface and with its axis extending transversely to the plane of the bridging portion between the legs, comprising:
   a. an open ended elongated channel member for slidably retaining a plurality of the spacer members adapted to be positioned over the intersecting bars and having a loading opening and a discharge opening for said spacer member;
   b. restraining means connected to said channel member for engaging the underlying one of the bars to restrain it against lateral displacement relative to the overlying bar;
   c. crank means pivoted to said channel member and having finger means for engaging beneath the underlying bar;
   d. linkage means connected to said crank means at a point spaced from its pivot point to said channel member and slidably mounted on said channel member for actuating said crank means to move said finger means into engagement with and beneath the underlying bar and to lift it into said recesses, and
   e. ejection means carried by said crank means for forcing the lower most spacer member from said discharge opening, bringing said spacer member into forced contact with the bars as said crank means are being moved to lift the underlying bar into said recesses.

5. A tool according to claim 4 in which the linkage means comprise a connecting rod pivotally connected at one end of said crank means at a laterally spaced distance from the channel member, the other end being pivoted to a pusher rod reciprocably mounted on said channel member to provide a knee joint.

6. A tool according to claim 5 in which the linkage means includes spring means connected at one end to the channel member and at the other end adjacent said knee joint.

7. A tool according to claim 4 in which the discharge end of the channel member is connected to a foot member having an opening accommodating the intersecting bars and to the opposite sides of which are connected said crank means and said restraining means.

8. A tool according to claim 4 having means adjacent the discharge opening for retaining and aligning the spacer member in a position for engagement with said ejection means.

9. A tool according to claim 4 in which said channel member is provided with vertically adjustable stop means for engaging the overlying bar when arranged at a predetermined level to support the tool thereon.

10. A tool according to claim 5 in which the discharge end of the channel member is connected to a foot member having an opening accommodating the intersecting bars and to the opposite sides of which are pivoted said restraining means and said crank means.

11. A tool according to claim 10 in which the linkage means comprise a connecting rod pivotally connected at one end to said crank means at a laterally spaced distance from the channel member, the other end being pivoted to a pusher rod reciprocably mounted on said channel member to provide a knee joint.

12. A tool according to claim 4 which is provided with load means for application to the spacer members to exert a downward force thereon in the channel.

13. A tool according to claim 12 which is provided with means for preventing inadvertent release of said load means.

14. A tool according to claim 12 in which the channel member adjacent the loading end is provided with an arcuate slide guide to accommodate the load means when in inoperative position.

15. A tool according to claim 14 in which the load means is provided with means for engaging said arcuate slide guide to maintain connection between the tool and the load means when removed from the channel to permit loading of spacer members.

16. A tool according to claim 4 in which the crank means are provided with an arcuate recess providing a glide surface for the underlying bar during the lifting operation and defining said finger means.

17. A tool according to claim 4 in which said channel member has a cross section substantially corresponding to the cross section of the spacer member.

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